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LIST OF SEISMOLOGICAL STATIONS  
OF THE WORLD

SECOND EDITION

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Section of Seismology of the American Geophysical Union  
with the Cooperation of the Research Information Service,  
National Research Council, U. S. A.

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## INTRODUCTION

In July 1921, the National Research Council published as Bulletin No. 15, "A List of Seismologic Stations of the World," by Harry O. Wood, at that time Secretary of the American Geophysical Union.

At the meeting of the Section of Seismology of the International Geodetic and Geophysical Union in Prague in 1927, it was announced that the National Research Council had decided to issue a new list of stations, because many changes in instrumental equipment had been made at old stations, and also because a number of new stations had since been established.

The National Research Council requested C. J. West, Director of its Research Information Service, to collect the information for the new list and to take general charge of the publication. For use in this work a new form of questionnaire, prepared by H. O. Wood, was circulated in 1928 to all known seismologic stations, and again in 1929 to those stations from which no replies had been received. By January 1930, replies had been received from the majority of stations circularized. Owing to the great mass of information contained in those replies it was felt that a much simpler form of publication than that used in the original book would meet practically all of the requirements and at the same time result in reduced cost. Experience having shown that a publication of this kind cannot remain current for many years, the amount of effort given to its preparation should be adjusted to this fact.

It was therefore decided that a committee of three members of the Section of Seismology of the American Geophysical Union should be appointed for the purpose of placing the information in final form for publication. The committee appointed consisted of H. E. McComb, Chairman, H. O. Wood, and James B. Macelwane, S. J. The Chairman compiled the data from the questionnaires and from other sources, carrying out the details of the committee work by correspondence.

After an announcement was made at the Stockholm meeting of the International Geodetic and Geophysical Union in 1930, that this publication would go to press within a reasonable time, considerable international interest was manifest in this project.

Information which had not been included in the questionnaires was obtained from station bulletins, instrumental reports, etc. In the case of the Japanese stations, the "List of Seismological Stations of Japan," issued in June 1930, and presented at the Stockholm meeting, was very useful. As no replies were received from a number of stations listed in the

former publication, these are omitted from the new list. It is desired that information relative to omissions, errors, new stations, etc., should be forwarded to the National Research Council so that supplements to this publication may be issued if that is found desirable and practicable.

It has not been possible to include in this publication all of the information contained in the replies to questionnaires but it is believed that the information omitted is needed only in special cases. The complete information for any particular station from which a questionnaire has been received will be made available to those who may desire it.

It was proposed that a list of seismologists should be included but owing to the fact that many outstanding seismologists are not directly associated with seismological stations it was finally decided that this list should be treated as a separate project and as such it is commended to the International Seismological Association.

The preparation of a map of the world showing the distribution of seismological stations was given consideration. It soon became apparent, however, that a map of suitable dimensions for showing all of the stations would be so large as to make it impractical and inconvenient for use in connection with a publication of this kind. In a smaller map the stations in Japan, for example, would be so crowded as to cover the entire space. For these reasons it was decided to omit the map.

The stations have been arranged alphabetically for the whole world, each station having a number and being referred to by this number in all cases where cross references are necessary, or where a station is known by more than one name.

A card questionnaire has been prepared and inserted in each volume for use by the proper administrative official at each station in submitting additions or corrections.

Although this publication is intended for international use it has been necessary, on account of the limited funds available, to confine it to the English language only.

Opportunity is taken here to express appreciation to the organizations and stations for their splendid cooperation, which has made this publication possible.

#### EXPLANATION OF TABLES

For the sake of uniformity all descriptions of stations are arranged in the following manner:

- A. Postal address of the seismological station.
- P. Official in charge of the station, and other personnel.
- C.-F. Geographical coordinates, elevation above sea-level, natural lithologic foundation upon which the pier rests and depth to water table.

- I. Instruments in operation showing dates of inauguration of station or installation of new equipment.
- S. Supporting institutions or affiliated organizations.
- Pu. Seismological bulletin, annual report, special publication, etc., in which results are published.

The stations have been listed alphabetically and referred to by number for convenience in cross reference.

The tables of instrumental constants were compiled from the questionnaires and from the latest available seismological bulletins at hand. In general these tables show the different types of instruments in operation; components; natural, undamped period of the seismometer ( $T_0$ ) or  $T_s$ ); the maximum nominal magnification ( $V_m$ ); kind of damping; damping ratio ( $\epsilon$ ), that is, the ratio of any two successive amplitudes of the undamped oscillations of the seismometer or system; the frictional coefficient ( $r/T_0^*$ ); the paper speed, that is, the peripheral speed of the recorder; and direction of motion of the steady mass corresponding to upward motion on the seismogram (Up). In the case of Galitzin instruments the following additional constants are given: the length of the equivalent simple pendulum ( $l$ ); the damping constant ( $\mu^2$ ); the distance from galvanometer lens to face of recorder ( $A_1$ ); the undamped period of the galvanometer ( $T_g$ ); and the transfer constant ( $k$ ), a constant depending upon the value of the inductive coupling.

## SEISMOLOGICAL STATIONS

### 1. Aachen.

A. Erdbebenwarte der Technischen Hochschule, Wullnerstrasse 2, Aachen, Deutschland.

P. P. Wilski, Director.

C.-F.  $50^{\circ} 47' N$ ;  $6^{\circ} 05' E$ . 179 m. Sandy clay.

I. Wiechert, N and E, 1906; Wiechert photographic, N, E and Z.

S. Technische Hochschule, Aachen.

Pu. Special Observatory Publication.

### 2. Abisko.

A. Abisko Geofysiska Observatorium, Abisko, Lapland, Sweden, or Bruno Rolf, Meteorological Bureau, Stockholm 8, Sweden.

P. Bruno Rolf, Director; N. R. F. Enger, Observer.

C.-F.  $68^{\circ} 21' N$ ;  $18^{\circ} 49' E$ . 385 m. Morainic material on schist. 12 m to water.

I. Wiechert, N, at Vassijaure, 1906; transferred to Abisko in 1915; Galitzin, N, E and Z.

S. Foreningen Vassijaure Naturvetenskapliga Station.

Pu. No.

Academie des Sciences de l'U. S. S. R. See Sebastopol, No. 271; Simferopol, No. 277; Vladivostok, No. 338.

### 3. Accra.

A. Seismological Station, Accra, Gold Coast Colony, West Africa.

P. Jack R. W. Reid, Officer in charge.

C.-F.  $5^{\circ} 32' N$ ;  $0^{\circ} 12' W$ .

I. Milne, 1914.

S. The Government of the Gold Coast.

Pu. International Seismological Summary, Oxford, England.

Açores, Serviço Meteorológico dos. See Ponta Delgada, No. 239.

### 4. Adelaide.

A. Adelaide Observatory, Adelaide, South Australia.

P. G. F. Dowell, Government Astronomer, in charge; A. L. Dawson, A. E. Markey, R. V. Burton, Assistants.

C.-F.  $34^{\circ} 56' S$ ;  $138^{\circ} 35' E$ . 43 m. Marly limestone over clay.

*I.* Milne, E, 1909; Milne-Shaw, N, 1925.

*S.* Ministry of Education, Government of South Australia.

*Pu.* International Seismological Summary, Oxford, England.

Agana. *See* Guam, No. 87.

**5. Agra.**

*A.* Upper Air Observatory, Agra, Agra and Gudh, India.

*P.* G. Chatterjee, in charge; N. K. Sur, B. N. Screenivasaiah,  
D. M. Patel.

*C.-F.*  $27^{\circ} 10' N$ ;  $78^{\circ} 05' E$ . 170 m. Gravel. 12 m to water.

*I.* Omori-Ewing, N and E, 1929.

*S.* Government of India.

*Pu.* India Weather Review.

Agram. *See* Zagreb, No. 348.

**6. Aidu.**

*A.* Aidu Meteorological Observatory, Aidu, Japan.

*P.*

*C.-F.*  $37^{\circ} 34' N$ ;  $140^{\circ} 07' E$ .

*I.* Milne seismometer, horizontal.

*S.*

*Pu.*

Aiti-ken Meteorological Observatory. *See* Nagoya, No. 206.

**7. Akita.**

*A.* Akita Meteorological Observatory, Akita, Japan.

*P.* K. Funayama, Director.

*C.-F.*  $39^{\circ} 41' N$ ;  $140^{\circ} 06' E$ . 60 m. Soft ground.

*I.* Imamura, N and E; Omori tromometer, N and E; 1914.

Wiechert, N, E and Z.

*S.*

*Pu.*

**8. Albany.**

*A.* Director, New York State Museum, Albany, New York,  
U. S. A.

*P.*

*C.-F.*

*I.* Bosch-Omori, 1906; discontinued in 1913 due to change in site.

*S.* University of the State of New York.

*Pu.* No.

**9. Alger-Bouzaréah.**

A. Station Seismique, Observatoire d'Alger-Bouzaréah, Algérie.

P. F. Gonnessiat, Director.

C.-F.  $36^{\circ} 48' N$ ;  $3^{\circ} 02' E$ . 332 m. Schists and limestones.

I. Bosch-Mainka, N and E, 1911.

S. University Observatory.

Pu.

**10. Alicante.**

A. Ingeniero Jefe de la Estación Sismológica de Alicante, España.

P. D. José Poyato y Osuna, Director.

C.-F.  $38^{\circ} 21' N$ ;  $0^{\circ} 29' W$ . 35 m. Upper cretaceous (marls).

I. Mainka, N and E; Wiechert, Z; service began 1914.

S. Instituto Geográfico y Catastral (State Office).

Pu. Seismological Bulletin, Instituto Geográfico y Catastral.

**11. Alipore.**

A. The Observatory, Alipore, Calcutta, India.

P. V. V. Sohoni, in charge.

C.-F.  $22^{\circ} 32' N$ ;  $88^{\circ} 20' E$ . 6 m. Alluvium.

I. Milne, 1899. Replaced by Omori-Ewing, N and E, 1915.

S. Government of India.

Pu. India Weather Review.

**12. Alma-Ata.**

A. Alma-Ata, Turkestan, U. S. S. R. (Formerly Verny).

P. N. A. Kharin, Official in charge.

C.-F.  $43^{\circ} 16' N$ ;  $76^{\circ} 57' E$ . 800 m. Sandy and muddy strata interbedded with gravel.

I. Nikiforoff, N and E, 1927

S. Commissariate of Agriculture of Kasakstan.

Pu. No.

**13. Almeria.**

A. Estación Sismológica y Meteorologica, Almeria, España.

P. José Rodríguez Navarro de Fuentes, Ingeniero Geográfico, Jefe; Domingo Liria Valls, Auxiliar administrativo.

C.-F.  $36^{\circ} 51' N$ ;  $2^{\circ} 28' W$ . 65 m. Calcareous limestone.

I. Vicentini, N, E and Z; Bosch, N and E; Mainka, N, E and Z; service began 1911.

S. Instituto Geográfico y Catastral, Madrid.

Pu. Monthly Bulletin, Instituto Geográfico y Catastral, Madrid.



**14. Amboina.**

A. Batavia Observatory, Java, Netherlands East Indies.

P.

C.-F.  $3^{\circ} 42' S$ ;  $128^{\circ} 10' E$ . 4 m. Quaternary.

I. Wiechert, N and E, 1924.

S. Royal Observatory, Batavia.

Pu. Seismological Bulletin, Batavia.

**15. Ambulong, Batangas, P. I.**

A. Manila Observatory, Manila, P. I.

P.

C.-F.  $14^{\circ} 07' N$ ;  $121^{\circ} 04' E$ . 10 m.

I. Vicentini, N, E and Z. Time not reliable.

S. Philippine Government.

Pu. Seismological Bulletin, Manila Observatory.

American University of Beirut. *See* Beirut, No. 29.

**16. Andalgala.**

A. Estación sismológica, Andalgala, F/C. C. N. A., Argentina.

P. Max Schmidt, Director.

C.-F.  $27^{\circ} 36' S$ ;  $66^{\circ} 26' W$ . 1072 m. Rock.

I. Milne, N and E, 1910.

S. Ministerio de Agricultura, Republica Argentina.

Pu. Meteorological Bulletin of Argentina.

**17. Ann Arbor.**

A. Seismological Station, Astronomical Observatory, University of Michigan, Ann Arbor, Michigan, U. S. A.

P. Ralph H. Curtiss, Director; Mary E. Lindsey, Assistant.

C.-F.  $42^{\circ} 17' N$ ;  $83^{\circ} 44' W$ . 282 m. Clay. 15 m to water.

I. Bosh-Omori, N and E; Wiechert, N, E and Z; 1909.

S. University of Michigan.

Pu. Publications of the Astronomical Observatory.

**18. Apia.**

A. The Observatory, Apia, Western Samoa.

P. F. W. Glover, Assistant Director.

C.-F.  $13^{\circ} 48' S$ ;  $171^{\circ} 46' W$ . 2 m. Coral sand. 3 m to water.

I. Wiechert, N, E and Z, 1904.

S. Government of New Zealand.

Pu. Quarterly report.

**19. Asahigawa.**

A. Asahigawa Meteorological Observatory, Asahigawa, Hokkaido, Japan.

*P.* N. Hoshikawa, in charge.

*C.-F.*  $43^{\circ} 47' N$ ;  $142^{\circ} 22' E$ . 111 m.

*I.* C. M. O. type, 1919.

*S.* Hokkaido Government.

*Pu.* Reports to Central Astronomical Observatory of Tokyo.

## 20. Ascension.

*A.* Eastern, Eastern Extension and Pacific Telegraph Co., Island of Ascension.

*P.*

*C.-F.*  $7^{\circ} 57' S$ ;  $14^{\circ} 21' W$ .

*I.* Milne, E, 1910. (Not functioning at present.)

*S.*

*Pu.*

## 21. Athens.

*A.* Section Géodynamique, Observatoire National d'Athènes, Grèce.

*P.* D. Eginitis, Director; N. Critikos, Chief of Geodynamical Section.

*C.-F.*  $37^{\circ} 58' N$ ;  $23^{\circ} 43' E$ . 95 m. Limestone.

*I.* Mainka, N and E; Wiechert, N, E and Z. Service began 1899.

*S.* Ministry of Public Instruction.

*Pu.* Monthly Bulletin, National Observatory of Athens.

## 22. Awomori.

*A.* Awomori Meteorological Observatory, Awomori, Japan.

*P.* S. Kimura, Director.

*C.-F.*  $40^{\circ} 49' N$ ;  $140^{\circ} 47' E$ .

*I.* Omori portable, horizontal.

*S.*

*Pu.*

Bagnères de Bigorre. *See* Pic du Midi, No. 235

## 23. Baguio, Benguet, P. I.

*A.* Manila Observatory, Manila, P. I.

*P.*

*C.-F.*  $16^{\circ} 25' N$ ;  $120^{\circ} 36' E$ . 512 m.

*I.* Vicentini, N, E and Z. Omori, N and E. Time not reliable.

*S.* Philippine Government.

*Pu.* Seismological Bulletin, Manila Observatory.

**24. Baku.**

A. Baku, Bely Gorod, Lunacharski Garden 102, Baku, Caucasus, U. S. S. R.

P. N. V. Malinovskij, Official in charge.

C.-F.  $40^{\circ} 23' N$ ;  $49^{\circ} 54' E$ . 12 m. Clay and sand.

I. Galitzin, N, E and Z, 1912. Service began 1903 with Repsold pendulums.

S. Academy of Sciences of the U. S. S. R., Leningrad.

Pu. Monthly Bulletin, Baku, and Academy of Sciences, Leningrad.

**25. Balboa.**

A. Chief of Surveys, Balboa Heights, Canal Zone, Central America.

P. R. Z. Kirkpatrick, Chief of surveys; G. E. Matthew, in charge.

C.-F.  $8^{\circ} 58' N$ ;  $79^{\circ} 33' W$ . 28 m. Basalt.

I. Bosch-Omori, 25 kg, N and E; Bosch-Omori, 100 kg., N and E; 1908.

S. Panama Canal.

Pu. Monthly Bulletin.

**26. Barcelona.**

A. Real Academia de Ciencias y Artes, Estacion Sismica, Rambla de los Estudios-9, Barcelona, España.

P. Eduardo Fontseré, Director.

C.-F.  $41^{\circ} 25' N$ ;  $2^{\circ} 08' E$ . 405 m. Paleozoic slates.

I. Mainka, N and E; Vicentini, Z; Vicentini Micro-seismograph, N; service began, 1914.

S. Real Academia de Ciencias y Artes de Barcelona.

Pu. Monthly Bulletin.

**27. Basle.**

A. Prof. Dr. Th. Niethammer, Binnigen, Basle, Switzerland.

P. Th. Niethammer.

C.-F.  $47^{\circ} 34' N$ ;  $7^{\circ} 30' E$ .

I. Expect to install instruments similar to those at Zurich.

S. Astronomisch-meteorologische Anstalt der Universität, Basle.

Pu. No.

**28. Batavia.**

A. Batavia Observatory, Weltevreden, Java, Netherlands East Indies.

P. S. W. Visser, in charge.

C.-F.  $6^{\circ} 11' S$ ;  $106^{\circ} 46' E$ . 8 m. River quaternary.

*I.* Bosch, N and E, 1912; Wiechert, N and E, 1908. Wiechert, Z, 1926.

*S.* Royal Observatory, Batavia.

*Pu.* Seismological Bulletin, monthly and annual.

Batavia Observatory. *See* Amboina, No. 14; Batavia, No. 28; Malabar, No. 169; Maron, No. 173; Medan, No. 179.

## 29. Beirut.

*A.* Observatory, American University of Beirut, Beirut, Syria.

*P.* J. A. Brown, Director.

*C.-F.* 33° 54' N; 35° 28' E. 30 m. Limestone.

*I.* Milne, E, 1902. (Service temporarily suspended.)

*S.* American University Observatory.

*Pu.*

Belén, Colegio de. *See* Havana, No. 95.

## 30. Belgrade.

*A.* Institut Seismologique a Tasmaidan, Belgrade, Jugoslavie.

*P.* Yélénko Mihailovitsch, Director; Adjoint, Rajica Marinkovitsch.

*C.-F.* 44° 49' N; 20° 27' E. 129 m. Calcareous rock.

*I.* Galitzin, horizontal; Wiechert, N, E and Z; Mainka, horizontal; Belar, N, E and Z; Conrad, horizontal; began 1909.

*S.* Université de Belgrade.

*Pu.* Provisional Monthly Bulletin; "Annuaire Seismique" of Microseisms.

## 31. Benevento.

*A.* Osservatorio Meteorologico e Geodinamico, Benevento, Italia.

*P.* F. Venanzio Vari.

*C.-F.* 41° 08' N; 14° 48' E. 154 m.

*I.* Agamennone, N and E; Tromosismometrografo, NE and NW; began 1884.

*S.* Collegio de la Salle.

*Pu.* Occasional publication.

## 32. Bergen.

*A.* Jordskjaelvsstationen, Bergens Museum, Bergen, Norge.

*P.* Carl Fred Kolderup, Director.

*C.-F.* 60° 24' N; 5° 18' E. 22 m. Gneiss.

*I.* Wiechert, N, E and Z; Bosch, N and E; service began 1904.

*S.* Geological Institute of Bergens Museum.

*Pu.* Seismological Bulletin, Quarterly.

**33. Berkeley.**

A. Seismograph Station, University of California, Berkeley, California, U. S. A.

P. Perry Byerly, Assistant Professor of Seismology.

C.-F.  $37^{\circ} 52' N$ ;  $122^{\circ} 16' W$ . 85 m. Sandstone.

I. Bosch-Omori, N and E; Wiechert, Z, 1910; Wood-Anderson, N and E; Wilip-Galitzin, N, E and Z.

S. University of California.

Pu. Bulletin of the Seismographic Stations.

**34. Besançon.**

A. Observatoire National de Besançon, Besançon, Doubs, France.

P. A. Lebeuf, Director; M. R. Goudey, in charge.

C.-F.  $47^{\circ} 15' N$ ;  $5^{\circ} 59' E$ . 311 m. Clays and marls on sandstone.

I. Mainka, N and E, 1910.

S. Observatoire de Besançon.

Pu. Monthly Bulletin, Strasbourg, France.

**35. Bidston.**

A. Liverpool Observatory, Bidston, Birkenhead, England.

P. J. Proudman, Director; A. T. Doodson, Associate Director.

C.-F.  $54^{\circ} 24' N$ ;  $3^{\circ} 14' W$ . 61 m. Sandstone.

I. Milne-Shaw, N, 1926; Milne, 1898, discontinued.

S. University of Liverpool and Mersey Docks and Harbour Board.

Pu. International Seismological Summary, Oxford, England.

Blackburn. See Stonyhurst, No. 283.

**36. Bochum.**

A. Erdbebenwarte der Westfälischen Berggewerkschaftskasse zu Bochum, Bochum, Westfalen, Deutschland.

P. W. Lohr, Surveyor.

C.-F.  $51^{\circ} 30' N$ ;  $7^{\circ} 14' E$ . 118 m. Alluvium.

I. Wiechert, 200 kg, N and E; Wiechert, 1000 kg, N and E; Wiechert, Z; service began 1908.

S. Westfälische Berggewerkschaftskasse zu Bochum.

Pu. Reports to Jena.

**37. Bogota.**

A. Observatorio Nacional de San Bartolomé, Bogota, Colombia.

P. S. Sarasola, Director.

C.-F.

*I.* No instruments.

*S.*

*Pu.*

Bombay. *See* Colaba, No. 59.

Bruxelles. *See* Uccle, No. 326.

### 38. Budapest.

*A.* Budapesti Földrengesi Observatorium, VIII Muzeum Körút, 6-8, Budapest, Hungary.

*P.* Rado de Kövesligethy, Director.

*C.-F.*  $47^{\circ} 29' N$ ;  $19^{\circ} 04' E$ . 110 m. Sand and alluvium. 8 m to water.

*I.* Wiechert, N and E; Galitzin, second order, N and E; Quervain-Piccard, portable, N, E and Z.

*S.* Association of the Hungarian National Collections and Museums.

*Pu.* Observatory Quarterly Report.

### 39. Buffalo.

*A.* Seismological Observatory, Canisius College, Buffalo, New York, U. S. A.

*P.* John P. Delaney, Director; Austin McTigue and Fred Goeddeke, Assistant Directors.

*C.-F.*  $42^{\circ} 56' N$ ;  $78^{\circ} 51' W$ . 191 m. Cherty limestone. 1.2 m to water.

*I.* Wiechert, N and E; Galitzin-Wilip, Z; began, 1911; Galitzin-Wilip, 1930.

*S.* Canisius College.

*Pu.* Bulletin, Jesuit Seismological Association, Saint Louis University, St. Louis, Missouri, U. S. A.

### 40. Butuan, Agusan, Mindanao, P. I.

*A.* Manila Observatory, Manila, P. I.

*P.*

*C.-F.*  $8^{\circ} 56' N$ ;  $125^{\circ} 32' E$ . 2 m.

*I.* Wiechert, N and E. Time not reliable

*S.* Philippine Government.

*Pu.* Seismological Bulletin, Manila Observatory.

Cadiz. *See* San Fernando, No. 261.

Cairo. *See* Helwan, No. 101.

Calcutta. *See* Alipore, No. 11.

California, University of. *See* Berkeley, No. 33.

**41. Cambridge.**

A. Harvard Seismograph Station, Geology Museum, Oxford St., Cambridge, Massachusetts, U. S. A.

P. Kirtley F. Mather, Chairman, Department of Geology and Geography; L. Don Leet, Professor of Seismology.

C.-F.  $42^{\circ} 23' N$ ;  $71^{\circ} 07' W$ . 5 m. Glacial sand and clay. 5 m to water.

I. Milne-Shaw, N and E, 1928; Bosch-Omori, N and E, 1908; latter discontinued when Milne-Shaw instruments installed.

S. Harvard University.

Pu. Monthly bulletin.

Canisius College. See Buffalo, No. 39.

**42. Cape of Good Hope.**

A. Royal Observatory, Cape Town, Cape of Good Hope, South Africa.

P. H. Spencer Jones, H. M. Astronomer at the Cape.

C.-F.  $33^{\circ} 56' S$ ;  $18^{\circ} 29' E$ . 13 m. Slate.

I. Milne-Shaw, E.

S. Admiralty, Imperial Government of Great Britain.

Pu. International Seismological Summary, Oxford, England.

**43. Cardiff.**

A. Cardiff Seismological Station, City Hall, Cardiff, Wales.

P. Ralph M. F. Picken, in charge.

C.-F.  $51^{\circ} 30' N$ ;  $3^{\circ} 10' W$ . 62 m. Sandstone.

I. Milne, 1909.

S. Cardiff City Council.

Pu. No.

**44. Carloforte.**

A. Regia Stazione Astronomica di Carloforte, Cagliari Sardegna, Italia.

P. Giovanni Peisino, Director.

C.-F.  $39^{\circ} 09' N$ ;  $8^{\circ} 19' E$ . 18 m. Trachyte.

I. Vicentini seismograph destroyed; resumed operation with Agamennone in 1928; N and E.

S. Regia Commissione Geodetica Italiana.

Pu. No.

**45. Cartuja.**

A. Estación Sismológica, Apartado No. 32, Granada, Spain.

P. S. Navarro Neumann, Director.

*C.-F.*  $37^{\circ} 12' N$ ;  $3^{\circ} 36' W$ . 768 m. Limestone.

*I.* Belarmino, Z; Canisio, E; Berchmans, N and E; Cartuja biflar, N, E and Z; Javier, E. Service began, 1903.

*S.* The order of S. J. and endowed by the Spanish Government.

*Pu.* Monthly bulletin.

Catamia. *See* Mineo, No. 184.

**46. Cernauti.**

*A.* Universitatea din Cernauti, Cernauti, Roumania.

*P.* N. Steliami, Director.

*C.-F.*  $48^{\circ} 17' N$ ;  $25^{\circ} 56' E$ . 225 m.

*I.* Mainka, N and E; not in operation.

*S.* Institutul de fizica cosmica.

*Pu.* No.

**47. Charlottesville.**

*A.* Rouss Physical Laboratory, University of Virginia, University, Virginia, U. S. A.

*P.* L. G. Hoxton, Director; Arthur J. Weed, in charge.

*C.-F.*  $38^{\circ} 02' N$ ;  $78^{\circ} 30' W$ .

*I.* Weed inverted pendulum, N and E.

*S.* University of Virginia.

*Pu.* Seismograms sent to U. S. Coast & Geodetic Survey, Washington, D. C., immediately after a seismic disturbance is recorded.

**48. Cheltenham.**

*A.* Cheltenham Magnetic Observatory, Cheltenham, Maryland, U. S. A.

*P.* George Hartnell, Observer in charge; S. Townshend, Assistant.

*C.-F.*  $38^{\circ} 44' N$ ;  $76^{\circ} 50' W$ . 72 m. Sand and gravel.

*I.* Bosch-Omori instruments dismantled in 1928; experimental station only at present.

*S.* U. S. Coast & Geodetic Survey, Washington, D. C., U. S. A.

*Pu.* Monthly Report; U. S. Earthquakes, Annual.

**49. Chiavari.**

*A.* Osservatorio Sismico del Seminario, Chiavari, Genoa, Italia.

*P.* Giovanni Sanguinets, Director.

*C.-F.*  $44^{\circ} 19' N$ ;  $9^{\circ} 19' E$ . 5 m. Alluvium.

*I.* Stiattesi, NE and SE; Alfani tromometrograph, SE; Vertical pendulum; service began, 1909.

*S.* Seminario Vescoville.

*Pu.* Appendix of the Meteorological Bulletin.



**50. Chicago.**

A. Seismological Station, Loyola University, Rogers Park, Chicago, Illinois, U. S. A.

P. G. J. Brunner.

C.-F.  $41^{\circ} 54' N$ ;  $87^{\circ} 38' W$ . 183 m. Sand. 3 m to water.

I. Wiechert, N and E, 1912.

S. Loyola University.

Pu. Monthly Bulletin.

**51. Chicago.**

A. Seismological Station, U. S. Weather Bureau Office, University of Chicago, Chicago, Illinois, U. S. A.

P. P. E. Johnson, Meteorologist in Charge.

C.-F.  $41^{\circ} 47' N$ ;  $87^{\circ} 37' W$ . 180 m. Bed rock.

I. Milne-Shaw, N and E, 1918.

S. U. S. Coast & Geodetic Survey, Washington, D. C., U. S. A.

Pu. Monthly Report; U. S. Earthquakes, Annual.

**52. Chihuahua.**

A. Estación Sismológica de Chihuahua, Chihuahua, Mexico.

P. Refugio Lara, in charge.

C.-F.  $28^{\circ} 38' N$ ;  $106^{\circ} 05' W$ . 1430 m. Rhyolitic tufa.

I. Wiechert, N, E and Z, 1927.

S. Instituto de Geológico, 6 del Cipres, núm. 176, Mexico, D. F.

Pu. Catalog de los Temblores, Annual.

**53. Christchurch.**

A. The Director, Magnetic Observatory, Christchurch, New Zealand.

P. Henry F. Skey, Director; Hamilton F. Baird, Assistant; J. W. Beagley, Computer.

C.-F.  $43^{\circ} 32' S$ ;  $172^{\circ} 37' E$ . 8 m. Alluvium. 20 meters to water.

I. Milne, E, 1901.

S. Department of Lands & Survey, New Zealand Government.

Pu. Records of the Survey of New Zealand, Annual; International Seismological Summary, Oxford, England.

**54. Chur.**

A. Erdbebenwarte der Kantonschule, Chur, Schweiz.

P. Alfred Kreis, Director.

C.-F.  $46^{\circ} 51' N$ ;  $9^{\circ} 32' E$ . 630 m. Solid rock.

I. Quervain-Piccard, N, E and Z, 1916.

S. Schweizerische Meteorologische Zentralanstalt in Zurich.

Pu. Collected Bulletins of Switzerland, Monthly; and Annual Report of Switzerland; Earthquake Service, Zurich.

**55. Cincinnati.**

A. St. Xavier College, Dana Avenue and Victory Parkway, Cincinnati, Ohio, U. S. A.

P. Vincent V. Herr, Director.

C.-F.  $39^{\circ} 09' N$ ;  $84^{\circ} 30' W$ . 203 m. Limestone.

I. Wood-Anderson, N and E, long period; Wood-Anderson, N and E, short period, 1927; Galitzin, Z, to be installed.

S. St. Xavier College.

Pu. Seismological Bulletin.

**56. Clausthal.**

A. Physikalisches Institut der Preussischen Bergakademie Clausthal, Clausthal (Harz), Deutschland.

P.

C.-P.  $51^{\circ} 48' N$ ;  $10^{\circ} 20' E$ . Solid rock.

I. Horizontal pendulum, 1908; discontinued.

S.

Pu.

**57. Cleveland.**

A. Angelo Secchi Observatory, John Carroll University, Cleveland, Ohio, U. S. A.

P. Frederick L. Odenbach, Director.

C.-F.  $41^{\circ} 29' N$ ;  $81^{\circ} 42' W$ . 206 m. Glacial drift. 5 m to water.

I. Wiechert, N, E and Z; Hengler Horizontal Pendulum; 1907.

S. John Carroll University.

Pu. No.

Cocos Island. See Keeling Islands, No. 131.

**58. Coimbra.**

A. The Director of the Instituto Geofisico de Universidade, Coimbra, Portugal.

P. Anselmo Ferraz de Carvalho, Director.

C.-F.  $40^{\circ} 12' N$ ;  $8^{\circ} 26' W$ . 140 m. Sandstone.

I. Wiechert, N, E and Z, 1903.

S. Universidade de Coimbra.

Pu. Monthly bulletin.

**59. Colaba.**

A. Government Observatory, Colaba, Bombay No. 5, India.

P. S. K. Banerji, in charge.

C.-F.  $18^{\circ} 54' N$ ;  $72^{\circ} 49' E$ . 6 m. Trap.

I. Milne, 1898; discontinued, 1918; Omori-Ewing, E, 1907; Horizontal Pendulum, local construction, N and E, 1907; Milne-Shaw, N, 1923.

S. Government of India.

Pu. India Weather Review.

Colegio Alberoni. *See* Piacenza, No. 233.

Colegio del Sagardo Corazon. *See* Sucre, No. 287.

College of the Pacific. *See* Stockton, No. 282.

#### 60. Colombo.

A. Colombo Observatory, Buller's Road, Colombo, Ceylon.

B. A. J. Bamford, Superintendent; H. Jameson, Assistant.

C.-F.  $6^{\circ} 54' N$ ;  $79^{\circ} 52' E$ . 7 m. Sandstone.

I. Milne, 1909-1927; Milne-Shaw, E, 1927.

S. Ceylon Survey Department, Colombo, Ceylon, India.

Pu. Annual Report Colombo Observatory; International Seismological Summary, University Observatory, Oxford, England.

#### 60.1. Columbia.

A. Department of Geology, University of South Carolina, Columbia, South Carolina, U. S. A.

P. Stephen Taber and A. C. Carson.

C.-F.  $34^{\circ} 00' N$ ;  $81^{\circ} 02' W$ . 94m. Semiconsolidated sand.

I. McComb-Romberg, N and E, Dec., 1930.

Su. Cooperative station of University of South Carolina and U. S. Coast and Geodetic Survey, Washington, D. C.

P. Seismological publications of the U. S. Coast and Geodetic Survey: (a) U. S. Earthquakes; (b) Monthly Bulletin.

#### 61. Copenhagen.

A. Geodetic Institute, Copenhagen, Denmark.

P. I. Lehmann, in charge.

C.-F.  $55^{\circ} 41' N$ ;  $12^{\circ} 27' E$ . 13 m. Chalk.

I. Galitzin, N, E and Z; Wiechert, N, E and Z; Milne-Shaw, N and E; Wood-Anderson, N and E, not functioning.

S. Geodaetisk Institut, Proviantgaarden, Copenhagen, Denmark.

Pu. Quarterly Bulletin.

#### 62. Copiapó.

A. Estación Sismológica de Copiapó, Copiapó, Chile.

P. Luis Sierra Vera, Director.

C.-F.  $27^{\circ} 21' S$ ;  $70^{\circ} 21' W$ . 370 m. Rock.

*I.* Wiechert, N and E, 1908.

*S.* University of Chile.

*Pu.* Seismological Service of Chile, Santiago, Chile.

Cornell University. *See* Ithaca, No. 120.

### 63. Dairen.

*A.* Meteorological Observatory, Kwanto, Dairen, Kwanto-shu, Japan.

*P.* S. Migunuchi, Director.

*C.-F.*  $38^{\circ} 54' N$ ;  $121^{\circ} 38' E$ . 97 m. Quartzite.

*I.* Omori tromometer, N and E, 1918; Wiechert, N, E and Z.

*S.*

*Pu.*

Dalhousie University. *See* Halifax, No. 90.

### 64. DeBilt.

*A.* Royal Netherlands Meteorological Institute, DeBilt, Netherlands.

*P.* E. Van Everdingen, Chief Director; G. Van Dijk, Director of Seismological Investigations.

*C.-F.*  $52^{\circ} 06' N$ ;  $5^{\circ} 11' E$ . 3 m. Sand.

*I.* Galitzin, N, E and Z; Wiechert, N and E; Bosch-Omori, N and E, 1908.

*S.* Royal Netherlands Meteorological Institute.

*Pu.* Annual Report, Seismic Registration.

### 65. Dehra Dun.

*A.* Director, Geodetic Branch, Survey of India, Dehra Dun, India.

*P.* J. de Graaff Hunter, in charge.

*C.-F.*  $30^{\circ} 19' N$ ;  $78^{\circ} 03' E$ . 683 m. Alluvium.

*I.* Omori, E., 1912.

*S.* Survey of India.

*Pu.* International Seismological Summary, University Observatory, Oxford, England.

### 66. Denton.

*A.* John W. Crain (Private Earthquake Station), Denton, Texas, U. S. A.

*P.* John W. Crain, in charge.

*C.-F.*  $33^{\circ} 13' N$ ;  $97^{\circ} 08' W$ . 208 m. Yellow clay.

*I.* Inverted Pendulum, local construction, E, 1925.

*S.* John Crain.

*Pu.* Reports to Jesuit Seismological Association and U. S. Coast & Geodetic Survey, Washington, D. C.

**67. Denver.**

*A.* Regis College Seismic Station, W. 50th Avenue and Lowell Boulevard, Denver, Colorado, U. S. A.

*P.* A. W. Forstall, Director.

*C.-F.*  $39^{\circ} 41' N$ ;  $104^{\circ} 57' W$ . 1655 m. Conglomerate.

*I.* Wiechert, N and E, 1909.

*S.* Regis College and Jesuit Seismological Association.

*Pu.* Seismological Bulletin, monthly, and Reports to Jesuit Seismological Association, St. Louis, Missouri.

Dominion Observatory. *See* Ottawa, No. 225; Wellington, No. 341.

**68. Dubrovnik.**

*A.* Station Seismologique, Dubrovnik II, Jugoslavie.

*P.* Jovan Krcmar, Director.

*C.-F.*  $40^{\circ} 39' N$ ;  $18^{\circ} 06' E$ . 20 m. Limestone.

*I.* Conrad, NW, 1928.

*S.* Institut Seismologique de Belgrad.

*Pu.* Provisional Monthly Bulletin; Annual Report, Belgrade.

**69. Ebro.**

*A.* Observatorio del Ebro, Apartado, 9 Tortosa, España.

*P.* Luis Rodas, Director.

*C.-F.*  $40^{\circ} 49' N$ ;  $0^{\circ} 30' E$ . Conglomerate.

*I.* Mainka, N and E; Vicentini, E and Z; Vertical Pendulum; began 1905.

*S.* Observatorio del Ebro.

*Pu.* Monthly bulletin.

**70. Edinburgh.**

*A.* Royal Observatory, Edinburgh, Scotland.

*P.* R. A. Sampson, Director.

*C.-F.*  $55^{\circ} 56' N$ ;  $3^{\circ} 11' W$ . 132 m. Lava.

*I.* Milne-Shaw, E, 1919; Bifilar pendulum, 1894; Second bifilar in 1898; Milne, 1900; all superseded by Milne-Shaw.

*S.* Royal Observatory.

*Pu.* International Seismological Summary, Oxford, England.

**71. Eger.**

*A.* Erdbebenwarte, Eger, Czechoslovakia.

*P.* Georg Irgang, in charge.

*C.-F.*  $50^{\circ} 05' N$ ;  $12^{\circ} 23' E$ . 430 m. Sand and clay.

*I.* Mainka, N; Belar-horizontal pendulum, N and E; service began 1908.

*S.* Staats-Anstalt für Geophysik in Prag.

*Pu.* Annual Report of State Industrial School, 1908-1914; Reports to Prague twice per month since 1914.

Ekaterinburg. *See* Sverdlovsk, No. 291.

**72. Eskdalemuir.**

*A.* Eskdalemuir Observatory, Eskdalemuir, Scotland.

*P.* A. H. R. Goldie, Superintendent; H. W. L. Absalom, Assistant Superintendent

*C.-F.*  $55^{\circ} 19' N$ ;  $3^{\circ} 12' W$ . 242 m. Stratified rock.

*I.* Galitzin, N, E and Z, 1908; transferred to Kew Observatory, in 1925.

*S.* The Meteorological Office, Air Ministry, Kingsway, London, W. C. 2.

*Pu.* British Meteorological and Magnetic Year Book, 1911-1921, London; The Observatories' Year Book, Meteorological Office, London, 1922-1925.

Fabra. *See* Barcelona, No. 26.

Firenze. *See* Florence, No. 73.

**73. Florence.**

*A.* Osservatorio Ximeniano, Piazza S. Lorenzo, Firenze, Italia.

*P.* Guido Alfani, in charge.

*C.-F.*  $43^{\circ} 47' N$ ;  $11^{\circ} 15' E$ . 75 m. Alluvium.

*I.* Alfani, N and E; Omori-Alfani, two comp; Vicentini, N, E and Z; Vicentini-microseismograph pantograph; Ortosismograph Alfani; Galitzin, N, E and Z.

*S.* Private observatory.

*Pu.* Monthly bulletin.

**74. Florence.**

*A.* Regio Osservatorio Astrofisico, Quarto-Castello, Firenze, Italia.

*P.* Raffaello Stiattesi, Director.

*C.-F.*  $43^{\circ} 49' N$ ;  $11^{\circ} 13' E$ . 120 m. Limestone.

*I.* Vicentini; Stiattesi, N and E, 1895.

*S.* Regio Osservatorio Astrofisico.

*Pu.* Seismological Bulletin.

**75. Florissant.**

*A.* Seismograph Station, St. Louis University, St. Louis, Missouri, U. S. A.

*P.* James B. Macelwane, Director; J. S. Joliat; George B. Blum.

*C.-F.* 38° 48' N; 90° 22' W. 160 m. Hard clay.

*I.* Wood-Anderson, N and E; Galitzin-Wilip, N, E and Z, 1928; Shortt clock.

*S.* St. Louis University.

*Pu.* Monthly Bulletin.

**76. Foggia.**

*A.* Specola Metero-Sismica, Foggia, Italy.

*P.* Michele Nigri, Director.

*C.-F.* 41° 27' N; 15° 31' E. 20 m.

*I.* Bertelli Tromometer; De Rossi Microsismograph; Cecchi Seismometer; Agamennone; Stiattesi, N and E.

*S.* Ufficio Centrale di Meteorologia e Geofizica, Roma.

*Pu.* Monthly report.

**77. Fordham.**

*A.* Seismic Station of Fordham University, New York, New York, U. S. A.

*P.* Joseph Lynch, Director.

*C.-F.* 40° 52' N; 73° 53' W. 26 m. Dolomite and Gneiss.

*I.* Wiechert, N and E; Milne-Shaw, N and E; Galitzin.

*S.* Fordham University, New York, N. Y.

*Pu.* Monthly Bulletin.

**78. Fort de France.**

*A.* Observatoire de la Martinique, Fort de France, Martinique.

*P.* Professor Simon, Director; Professor Boutin, Associate.

*C.-F.* 14° 44' N; 61° 09' W. 6 m. Tufa.

*I.* Bosch-Omori, N and E, 1902; Mainka, N and E, 1926; at new site: Elevation, 510 m.; 14° 36' N; 61° 04' W.

*S.* Colonie de la Martinique.

*Pu.* Monthly bulletin.

Frankfurt-am-Main. *See* Taunus, No. 304.1.

**79. Frunse.**

*A.* Seismologic Station, Frunse, Turkestan, U. S. S. R.

*P.* G. Okulich-Kasarin, Official in charge.

*C.-F.* 42° 53' N; 74° 35' E. 655 m. Gravel.

*I.* Nikiforoff, N and E, 1927.

*S.* Central Executive Committee of the Kirghiz, U. S. S. R.; Network of stations of Physico-Mathematical Institute of the Academy of Sciences of the U. S. S. R., Leningrad.

*Pu.* No.

**80. Fukui.**

*A.* Fukui Meteorological Observatory, Fukui, Japan.

*P.*

*C.-F.*  $36^{\circ} 03' N$ ;  $136^{\circ} 16' E$ .

*I.* C. M. O. horizontal.

*S.*

*Pu.*

Geodetic Institute, Copenhagen. *See* Scoresby-Sund, No. 270.

**81. Georgetown.**

*A.* Seismological Observatory, Georgetown University, Washington, District of Columbia, U. S. A.

*P.* F. W. Schon, Director

*C.-F.*  $38^{\circ} 54' N$ ;  $77^{\circ} 04' W$ . 42 m. Decayed diorite.

*I.* Mainka, N and E, 1911; Bosch-Omori (discontinued); Wiechert, N and E; Galitzin, Z; Galitzin, N and E, 1930.

*S.* Georgetown University.

*Pu.* Seismological Bulletin.

Georgia, Geophysical Observatory of. *See* Tiflis, No. 306.

**82. Gifu.**

*A.* Gifu Meteorological Observatory, Gifu, Japan.

*P.* Y. Tanaka, Director.

*C.-F.*  $35^{\circ} 24' N$ ;  $136^{\circ} 46' E$ . 13 m. Soft ground.

*I.* Omori tromometer, N and E, 1910; Wiechert, N, E and Z.

*S.*

*Pu.*

**83. Göttingen.**

*A.* Geophysikalisches Institut der Universität Göttingen, Herzberger Landstr. 180, Göttingen, Deutschland.

*P.* E. Wiechert, Director.

*C.-F.*  $51^{\circ} 33' N$ ;  $9^{\circ} 58' E$ . 270 m. Solid rock.

*I.* Wiechert, N, E and Z; Wiechert, N, 17000 kg; service began 1908.

*S.* Universitäts-Institut.

*Pu.* No.

Gonzaga University. *See* Spokane, No. 281.

**84. Gorje.**

*A.* Sismologique Station a Gorje (près Bled), Jugoslavie.

*P.* M. Albin Belar, Chief of the station.



*C.-F.*  $46^{\circ} 23' N$ ;  $14^{\circ} 05' E$ . 600 m. Calcareous rock.

*I.* Belar pendulum, new construction.

*S.* Observatoire Belar.

*Pu.* Provisional Monthly Bulletin; Annual Report, Belgrad.

Granada. *See* Cartuja, No. 45.

#### 85. Graz.

*A.* Erdbebenstation am Physikalischen Institut der Universität Graz, Graz, Steiermark, Oesterreich.

*P.* Hans Bendrof, Director.

*C.-F.*  $47^{\circ} 05' N$ ;  $15^{\circ} 27' E$ . 375 m. Shale.

*I.* Wiechert, N and E.

*S.* Physikalisches Institut der Universität Graz.

*Pu.* Seismological Bulletin.

#### 86. Guadalajara.

*A.* Estación Sismológica de Guadalajara, Guadalajara, Mexico.

*P.* Benjamin del Rio, in charge.

*C.-F.*  $20^{\circ} 41' N$ ;  $103^{\circ} 50' W$ . 1567 m. Alluvium.

*I.* Wiechert, N, E and Z.

*S.* Instituto de Geológico, 6 del Cipres, num. 176, Mexico, D. F.

*Pu.* Catalog de los Temblores, Annual.

#### 87. Guam.

*A.* Governor of Guam, Agana, Guam, M. I.

*P.* Governor of Guam, Director; W. W. Rowley, in charge.

*C.-F.*  $13^{\circ} 28' N$ ;  $144^{\circ} 45' E$ . 5 m. 2 m to water.

*I.* Wiechert, N and E, 1914.

*S.* Manila Observatory, P. I.

*Pu.* Station Bulletin and Manila Observatory Bulletin.

#### 88. Haboro.

*A.* Haboro Meteorological Observatory, Haboro, Hokkaido District, Japan.

*P.*

*C.-F.*  $44^{\circ} 23' N$ ;  $141^{\circ} 42' E$ .

*I.* C. M. O. horizontal.

*S.*

*Pu.*

#### 89. Hakodate.

*A.* Hakodate Meteorological Observatory, Hakodate, Japan.

*P.* T. Kajinuma, Director.

*C.-F.*  $41^{\circ} 47' \text{ N}; 140^{\circ} 43' \text{ E}$ .

*I.* Omori portable, horizontal.

*S.*

*Pu.*

#### 90. Halifax.

*A.* Seismologic Station, Dalhousie University, Halifax, Nova Scotia, Canada.

*P.* H. L. Bronson, in charge.

*C.-F.*  $44^{\circ} 38' \text{ N}; 63^{\circ} 36' \text{ W}$ ; 46 m. Carbonaceous slate.

*I.* Mainka, N and E, 1915.

*S.* Dalhousie University and Dominion Observatory, Ottawa, Canada.

*Pu.* Dominion Observatory Publications, Ottawa, Canada.

#### 91. Hamada.

*A.* Hamada Meteorological Observatory, Hamada, Shimaneken, Japan.

*P.*

*C.-F.*  $34^{\circ} 54' \text{ N}; 132^{\circ} 04' \text{ E}$ .

*I.* Wiechert, N, E and Z.

*S.*

*Pu.*

#### 92. Hamamatsu.

*A.* Hamamatsu Meteorological Observatory, Hamamatsu, Japan.

*P.* M. Simidu, Director; T. Otsuka, Assistant.

*C.-F.*  $34^{\circ} 43' \text{ N}; 137^{\circ} 43' \text{ E}$ . 29 m. Soft ground. 10 m to water.

*I.* Omori portable tromometer, N and E, 1913.

*S.* The Sizenoka Prefecture.

*Pu.* Monthly Bulletin.

#### 93. Hamburg.

*A.* Hauptstation für Erdbebenforschung am Physikalischen Staatsinstitut, Hamburg, 36, Jungiusstrasse 9, Deutschland.

*P.* Richard Schütt, Director; Ernst Tams, in charge.

*C.-F.*  $53^{\circ} 33' \text{ N}; 9^{\circ} 59' \text{ E}$ . 17 m. Marl.

*I.* Wiechert, N, E and Z; Mainka, N and E; v. Reuber-Hecker, N and E; service began 1898.

*S.* Physikalisches Staatsinstitut der Hamburgischen Universität.

*Pu.* Monthly Bulletin.

Harvard University. See Cambridge, No. 41.

**94. Hatidyôzima.**

A. Hatidyôzima Meteorological Observatory, Hatidyôzima, Japan.

P.

C.-F.  $33^{\circ} 06' N$ ;  $139^{\circ} 50' E$ .

I. Wiechert, N, E and Z.

S.

Pu.

**95. Havana.**

A. Observatorio del Colegio de Belén, Marianao, Habana, Cuba.

P. M. Gutínez Lanza, Director.

C.-F.  $23^{\circ} 06' N$ ;  $82^{\circ} 21' W$ . 35 m. Limestone.

I. Bosch-Omori, N and E, 1907. (Service suspended temporarily.)

S. Colegio de Belén.

Pu.

**96. Haiwee.**

A. Seismological Laboratory, 220 North San Rafael Avenue, Pasadena, California, U. S. A.

P. Harry O. Wood, Research Associate in Seismology, Carnegie Institution of Washington.

C.-F.  $36^{\circ} 08' N$ ;  $117^{\circ} 59' W$ . 1110 m. Loosly cemented tuff. Depth to water unknown, probably slight.

I. Wood Anderson, N and E, 1929.

S. Carnegie Institution of Washington and Bureau of Water Works and Supply, City of Los Angeles, California.

Pu. No routine publication; see Pasadena.

Hawaiian Volcano Observatory. See Hilo, No. 103; Kona, No. 141; Uwekahuna, No. 331; Volcano House, No. 339.

Haynald Observatorium. See Kalocsa, No. 126.

**97. Heidelberg.**

A. Erdbebenwarte der Königstuhl-Sternwarte, Heidelberg, Baden, Germany.

P. H. Vogt, Official in charge.

C.-F.  $49^{\circ} 24' N$ ;  $8^{\circ} 43' E$ . 558 m. Sandstone.

I. Wiechert, N and E, 1904.

S. Government Observatory.

Pu. Reports to central station at Jena.

**98. Heijo.**

A. Heijo Meteorological Observatory, Heijo, Korea.

P.

C.-F.  $39^{\circ} 01' N$ ;  $125^{\circ} 41' E$ .

I. C. M. O. strong motion.

S.

Pu.

**99. Helgoland.**

A. Staatl. Biologische Anstalt auf Helgoland, Helgoland, Deutschland.

P. W. Mielck, Director; H. Hertling, Assistant.

C.-F.  $54^{\circ} 11' N$ ;  $7^{\circ} 53' E$ . 42 m. Sandstone.

I. Wiechert, N and E, 1907.

S. Preussisches Ministerium für Wissenschaft, Kunst und Volksbildung.

Pu. Reports sent to Universität Göttingen.

**100. Helsingfors.**

A. Laboratory of Physics, Brobergsterrassen, Helsingfors, Finland.

P. Henrik Renqvist, Director.

C.-F.  $60^{\circ} 10' N$ ;  $24^{\circ} 58' E$ . 20 m. Gneiss.

I. Mainka, N, E and Z, 1924.

S. University of Helsingfors.

Pu. Seismological Bulletin.

**101. Helwan.**

A. Observatory, Helwan (near Cairo), Egypt.

P. P. A. Curry, Director.

C.-F.  $29^{\circ} 51' N$ ;  $31^{\circ} 20' E$ . 116 m. Limestone.

I. Milne-Shaw, E; Replaced two Milne instruments which had been in operation since 1904.

S. Physical Department, Public Works Ministry, Egypt.

Pu. International Seismological Summary, Oxford, England.

**102. Hikone.**

A. Hikone Meteorological Observatory, Hikone, Japan.

P.

C.-F.  $35^{\circ} 16' N$ ;  $136^{\circ} 15' E$ .

I. Wiechert, N, E and Z.

S.

Pu.

**103. Hilo.**

A. Hawaiian Volcano Observatory, Volcano House, Hawaii, U. S. A.

P.

C.-F.  $19^{\circ} 44' N$ ;  $155^{\circ} 04' W$ .

I. Volcano Observatory type, N and E.

S. Hawaiian Volcano Observatory and U. S. Geological Survey.

Pu. Weekly Letter and Monthly Bulletin, Hawaiian Volcano Observatory; see Volcano House.

**104. Hiroshima.**

A. Hiroshima Meteorological Observatory, Hiroshima, Japan.

P.

C.-F.  $34^{\circ} 23' N$ ;  $132^{\circ} 27' E$ .

I. C. M. O. type; horizontal.

S.

Pu.

**105. Hof.**

A. Erdbeben Station, Hof, Bavaria, Germany.

P. Fr. Adami, Official in charge.

C.-F.  $50^{\circ} 19' N$ ;  $11^{\circ} 53' E$ . 573 m. Devon.

I. Wiechert, N, E and Z, 1908.

S. Nord-Oberfränkischer Verein für Natur-, Geschichts-, und Landeskunde.

Pu.

**106. Hohenheim.**

A. Erdbebenwarte, Hohenheim, Stuttgart, Deutschland.

P. A. Wigand, Director.

C.-F.  $48^{\circ} 43' N$ ;  $9^{\circ} 13' E$ . 396 m. Liassic.

I. Mainka, N and E; Bosch-Omori, N and E; Schmidt, Trifilar gravimeter; service began 1893.

S. Meteorologisch-Geophysikalischen Abteilung des Württembergischen. Statistischen Landesamts, Stuttgart.

Pu. Seismological Bulletin, Hohenheim, Stuttgart and Ravensburg, semi-annual.

**107. Hoko.**

A. Taihoku Sokko Syo, Taihoku, Taiwan (Formosa), Japan.

P. K. Ookuma, Director.

C.-F.  $23^{\circ} 32' N$ ;  $119^{\circ} 33' E$ . 9 m. Basaltic.

I. Gray-Milne, E, E and Z; Omori tromometer, E, 1900.

S. Government of Formosa.

Pu. No.

Holy Cross College. See Worcester, No. 342.

**108. Hong Kong.**

*A.* The Director, Royal Observatory, Hong Kong, China.

*P.* T. F. Claxton, Director.

*C.-F.*  $22^{\circ} 18' \text{ N}$ ;  $114^{\circ} 10' \text{ E}$ . 33 m. Disintegrated granite.

*I.* Milne-Shaw, N and E, 1921.

*S.* Government of Hong Kong.

*Pu.* Monthly Bulletin; International Seismological Summary, Oxford, England.

**109. Honolulu.**

*A.* U. S. Coast and Geodetic Survey, 5th Floor, Aloha Tower, Honolulu, Hawaii, U. S. A.

*P.* J. H. Peters, Officer in charge; H. Katakura and I. Miyake, Observers.

*C.-F.*  $21^{\circ} 18' \text{ N}$ ;  $157^{\circ} 49' \text{ W}$ ; 20 m. Alluvium on basalt.

*I.* Milne-Shaw, N and E, installed at Ewa, February, 1921, replacing Milne, E, which had been in operation since 1903; Milne-Shaw instruments moved from Honolulu Magnetic Observatory, Ewa, Hawaii, to University of Hawaii, Honolulu, in November, 1926, and March, 1927.

*S.* U. S. Coast and Geodetic Survey, Washington, D. C., and University of Hawaii, Honolulu, Hawaii.

*Pu.* Monthly Report; U. S. Earthquakes, Annual.

**110. Hukuoka.**

*A.* The Hukuoka Meteorological Observatory, Hukuoka, Japan.

*P.* T. Ikegami, Director; R. Hiroe, Assistant.

*C.-F.*  $33^{\circ} 35' \text{ N}$ ;  $130^{\circ} 25' \text{ E}$ . 4 m. Alluvium. 1.2 m to water.

*I.* Milne, N, E and Z, 1893; Omori, E, 1907; Omori, tromometer, N, 1907; C. M. O. type, N, E and Z, 1927.

*S.* Hukuoka prefecture.

*Pu.* Monthly Seismological Bulletin.

**111. Husan.**

*A.* Husan Seismic Station, Husan, Korea.

*P.*

*C.-F.*  $35^{\circ} 06' \text{ N}$ ;  $129^{\circ} 00' \text{ E}$ . 12 m. Porphyrite.

*I.* Omori Horizontal Pendulum, N.

*S.* Government-General of Tyosen, Korea.

*Pu.* Annual report, Meteorological Observatory of the Government-General of Tyosen.

**112. Husiki.**

*A.* Husiki Meteorological Observatory, Husiki, Japan.

*P.*

*C.-F.*  $36^{\circ} 47' \text{ N}$ ;  $137^{\circ} 03' \text{ E}$ .

*I.* Omori portable, horizontal.

*S.*

*Pu.*

**113. Hyderabad.**

*A.* Nizamiah Observatory, Begumpet, Hyderabad, Deccan, India.

*P.* T. P. Bhackaran, Director; M. K. Bappu, Assistant.

*C.-F.*  $17^{\circ} 26' \text{ N}$ ;  $78^{\circ} 57' \text{ E}$ . 554 m. Granite.

*I.* Milne-Shaw, E, 1923.

*S.* H. E. H. the Nizam's Government.

*Pu.* International Seismological Summary, Oxford, England.

**114. Idzuhara.**

*A.* Idzuhara Meteorological Observatory, Idzuhara, Kyúsyú District, Japan.

*P.*

*C.-F.*  $33^{\circ} 35' \text{ N}$ ;  $130^{\circ} 25' \text{ E}$ .

*I.* Omori portable, horizontal.

*S.*

*Pu.*

**115. Iida.**

*A.* Iida Meteorological Observatory, Iida, Japan.

*P.*

*C.-F.*  $35^{\circ} 31' \text{ N}$ ;  $137^{\circ} 50' \text{ E}$ .

*I.* Nakamura seismometer, horizontal.

*S.*

*Pu.*

Imperial Marine Observatory. *See* Kobe, No. 136.

**116. Innsbruck.**

*A.* Institut für kosmische Physik, Innsbruck, Schöpfstrasse 41, Oesterreich.

*P.* Arthur Wagner, Director.

*C.-F.*  $47^{\circ} 16' \text{ N}$ ;  $11^{\circ} 24' \text{ E}$ . 575 m. Alluvium.

*I.* Mainka, NE and NW, 1913.

*S.* Universität Innsbruck.

*Pu.* Seismological Catalog.

Institut de Physique du Globe. *See* Strasbourg, No. 284.

Institut für kosmische Physik. *See* Innsbruck, No. 116.

Institut Geophysique National Tschecoslovaque. *See* Prague, No. 243.

Institut Météorologique Central de Bulgarie. *See* Sofia, No. 280.

Institut Seismologique a Tasmaidan. *See* Belgrade, No. 30.

Instituto di Fisica. *See* Padova, No. 227.

Instituto Geofísico de Universidad. *See* Coimbra, No. 58.

Instituto Geográfico y Catastral. *See* Madrid, No. 166.

Instituto y Observatorio de Marina. *See* San Fernando, No. 261.

International Latitude Observatory. *See* Mizusawa, No. 193.

**117. Irkutsk.**

A. The Seismologic Station, No. 98 Bolshaya Blvnovs-Kaya Street, Irkutsk, Siberia, U. S. S. R.

P. Andrew S. Treskow, in charge.

C.-F.  $52^{\circ} 16' N$ ;  $104^{\circ} 19' E$ . 467 m. Hard clay.

I. Galitzin, N, E and Z. Service began 1901.

S. The Physico-mathematic Institut V. Steklov de l'Académie des Sciences de l'U. S. S. R.

Pu. Monthly Bulletin.

**118. Ishigakijima.**

A. Ishigakijima Meteorological Observatory, Okinawa-ken, Japan.

P. T. Iwasaki, Director.

C.-F.  $24^{\circ} 20' N$ ;  $124^{\circ} 09' E$ . 6 m. Coral reef.

I. C. M. O., N and E, 1915; Wiechert, N, E and Z.

S.

Pu.

**119. Ishinomaki.**

A. Ishinomaki Meteorological Observatory, Ishinomaki, Japan.

P.

C.-F.  $38^{\circ} 26' N$ ;  $141^{\circ} 19' E$ .

I. Omori portable, horizontal.

S.

Pu.

**120. Ithaca.**

A. Seismograph Station, Department of Geology, Cornell University, McGraw Hall, Ithaca, New York, U. S. A.

P. P. G. Sheldon, in charge.

C.-F.  $42^{\circ} 27' N$ ;  $76^{\circ} 29' W$ . 243 m. Ithaca shale.

I. Bosch-Omori, N and E, 1909.

S. Cornell University.

Pu. Monthly Bulletin and Reports to U. S. Coast & Geodetic Survey, Washington, D. C.



**120.1 Jena.**

*A.* Reichsanstalt für Erdbebenforschung, Jena, Deutschland.

*P.* Oskar Hecker, Director; August Sieberg, Dr. Krumbach, Scientific workers; Otto Meisser, H. Martin, F. Wolf, Assistants.

*C.-F.*  $50^{\circ} 56' N$ ;  $11^{\circ} 36' E$ . 195 m. Clay.

*I.* Wiechert, N and E. Vertical pendulum, 1300 kg; 15000 kg pendulum, E; service began 1926.

*S.* Reichsbehörde.

*Pu.* Seismological Bulletin, quarterly.

**121. Jinsen.**

*A.* Meteorological Observatory of the Government-General of Tyosen, Jinsen, Tyosen, Korea.

*P.* I. Goto, Director.

*C.-F.*  $37^{\circ} 29' N$ ;  $126^{\circ} 37' E$ . 69 m. Orthogneiss.

*I.* Omori Tromometer, N and E; Wiechert, N, E and Z. Strong motion Seismometer, N, E and Z; Omori Portable Seismometer, N and E, 1915.

*S.* The Government-General of Tyosen.

*Pu.* Annual report.

**122. Johannesburg.**

*A.* Union Observatory, Johannesburg, South Africa.

*P.* W. W. Worssell, Scientific Assistant in charge.

*C.-F.*  $26^{\circ} 11' S$ ;  $28^{\circ} 04' E$ . 1806 m. Quartzite.

*I.* Wiechert, N and E, 1910.

*S.* Union Observatory.

*Pu.* No.

John Carroll University. *See* Cleveland, No. 57.

**123. Kabansk.**

*A.* Seismologic Station, Kabansk, Transbaikalia, Siberia, U. S. S. R.

*P.* N. A. Krassilnikov, Official in charge.

*C.-F.*  $52^{\circ} 03' N$ ;  $106^{\circ} 37' E$ . 470 m. Diluvium.

*I.* Galitzin, N and E, 1912.

*S.* Academy of Sciences of the U. S. S. R., Leningrad.

*Pu.* No.

**124. Kagoshima.**

*A.* Kagoshima Meteorological Observatory, Kagoshima, Japan.

*P.* Heitaro Maruoka, Director; Yoshio Imamura, Assistant.

*C.-F.*  $31^{\circ} 33' N$ ;  $130^{\circ} 34' E$ . 4 m. Soft ground. 1 m to water.

*I.* Omori tromometer, N and E; Imamura, N, E and Z, 1915; Wiechert to be installed.

*S.* Central Observatory, Tokyo.

*Pu.* Meteorological and Seismological Bulletin.

**125. Kakioka.**

*A.* Kakioka Meteorological Observatory, Kakioka, Japan.

*P.*

*C.-F.*  $36^{\circ} 14' N$ ;  $140^{\circ} 11' E$ .

*I.* Wiechert, N, E and Z.

*S.*

*Pu.*

**126. Kalocsa.**

*A.* Haynald Observatorium, Kalocsa, Hungary.

*P.* Theodore Angehrn, Director.

*I.* Wiechert, 200 kg; not in operation.

*C.-F.*  $46^{\circ} 32' N$ ;  $18^{\circ} 59' E$ . 92 m.

*S.*

*Pu.* No.

**127. Kamakura.**

*A.* Kamakura Seismological Station, Kamakura, Japan.

*P.*

*C.-F.*  $35^{\circ} 18' N$ ;  $139^{\circ} 32' E$ . Sand.

*I.* Strong motion, N, E and Z; No. 2, E; No. 3, Z; No. 4, N and E.

*S.* Tokyo Imperial University.

*Pu.* See Tokyo.

**128. Kanazawa.**

*A.* Kanazawa Meteorological Observatory, Kanazawa, Ishikawa-Ken, Japan.

*P.*

*C.-F.*  $36^{\circ} 32' N$ ;  $136^{\circ} 39' E$ .

*I.* Omori portable, horizontal.

*S.*

*Pu.*

Kansas, University of. *See* Lawrence, No. 155.

**129. Karenko.**

*A.* Taihoku Sokko Syo, Taihoku, Taiwan (Formosa), Japan.

*P.* N. Myojin, Director in charge.

*C.-F.*  $23^{\circ} 58' N$ ;  $121^{\circ} 36' E$ . 18 m. Alluvium.

*I.* Omori tromometer, N and E, 1914.

*S.* Government of Formosa.

*Pu.* No.

**130. Karlsruhe.**

*A.* Geodätisches Institut der Technischen Hochschule, Karlsruhe, Deutschland.

*P.* A. Schlötzer, Director; H. Merkel.

*C.-F.*  $49^{\circ} 01' N$ ;  $8^{\circ} 25' E$ . 114 m. Soil and gravel. 7 m to water.

*I.* Mainka, N and E; service began 1880.

*S.* Naturwissenschaftlichen Verein, Karlsruhe und Technische Hochschule, Karlsruhe.

*Pu.* Seismological Bulletin, monthly.

**131. Keeling Islands.**

*A.* Superintendent, Eastern Extension Telegraph Co., Ltd., Cocos Island, *via* Singapore.

*P.* P. C. Murray, in charge.

*C.-F.*  $12^{\circ} 12' S$ ;  $96^{\circ} 54' E$ .

*I.* Destroyed in 1914 and not replaced.

**132. Keijo.**

*A.* Keijo Meteorological Observatory, Keijo (Korea), Japan.

*P.*

*C.-F.*  $37^{\circ} 34' N$ ;  $126^{\circ} 59' E$ .

*I.* Omori portable, horizontal.

*S.*

*Pu.*

**133. Kew.**

*A.* Kew Observatory, Richmond, Surrey, England.

*P.* F. J. W. Whipple, Superintendent; F. J. Scrase, Seismologist.

*C.-F.*  $51^{\circ} 28' N$ ;  $0^{\circ} 19' W$ . 5 m. Gravel.

*I.* Galitzin, N, E and Z, 1925. (Milne, 1898, discontinued in 1925.)

*S.* Meteorological Office, Air Ministry.

*Pu.* Monthly Bulletin; Observatory Year Book.

Kiadvamjai. *See* Budapest, No. 38.

**134. Kingston.**

*A.* Government Meteorologist, Kingston, Jamaica, British West Indies.

*P.* J. F. Brennan, Meteorologist in charge.

*C.-F.* 17° 58' N; 76° 48' W. 32 m. Alluvium.

*I.* Gray-Milne, 1907; Duplex Pendulum, 1920; Horizontal Pendulum of local construction.

*S.* Private station.

*Pu.* No.

**135. Kiyosumi.**

*A.* The Kiyosumi Dendrological Laboratory, Kiyosumi, Awa, Japan.

*P.*

*C.-F.* 35° 09' N; 140° 11' E. 290 m. Tertiary.

*I.* No. 1; N and E.

*S.* Tokyo Imperial University.

*Pu.* See Tokyo.

Klausthal. See Clausthal, No. 56.

**136. Kobe.**

*A.* Imperial Marine Observatory, Kobe, Japan.

*P.* Kwanji Suda, Official in charge.

*C.-F.* 34° 41' N; 135° 11' E. 58 m. Diluvium.

*I.* Wiechert, N, E and Z; Omori, N and E; Strong Motion Seismometer, N, E and Z; 1907.

*S.* Imperial Marine Observatory and Kobe Meteorological Observatory.

*Pu.* Seismological Bulletin.

Kobe Meteorological Observatory. See Sumoto, No. 288; Toyooka, No. 315.

Kobenhavn. See Copenhagen, No. 61.

**137. Kochi.**

*A.* Kochi Sokkojo, Kochi, Shikoku, Japan.

*P.* S. Akamatsu, Director.

*C.-F.* 33° 33' N; 133° 32' E. 40 m. Serpentine.

*I.* Wiechert, N, E and Z; Omori, N and E; Omori Portable; Imamamura Strong Motion; 1926.

*S.* The Central Meteorological Observatory, Tokyo.

*Pu.* Monthly Bulletin.

**138. Kodaikanal.**

*A.* Director, Kodaikanal Observatory, Kodaikanal Observatory,

*P.* O., S. India.

*P.* T. Royds, Director.

*C.-F.* 10° 14' N; 77° 28' E. 2343 m. Charnockite rock.

*I.* Milne, E, 1898.

*S.* Government of India.

*Pu.* India Weather Review; International Seismological Summary, Oxford, England.

**139. Kodiak.**

*A.* Kodiak Seismograph Station, Kodiak, Alaska, U. S. A.

*P.* Ruth E. Floyd, Observer.

*C.-F.*  $57^{\circ} 47' \text{ N}$ ;  $152^{\circ} 24' \text{ W}$ . 43 m.

*I.* Hawaiian Volcano Observatory type, N and E, 1927.

*S.* Hawaiian Volcano Observatory and U. S. Geological Survey.

*Pu.* See Volcano House.

**140. Kofu.**

*A.* Kofu Meteorological Observatory, Kofu, Japan.

*P.*

*C.-F.*  $35^{\circ} 38' \text{ N}$ ;  $138^{\circ} 34' \text{ E}$ .

*I.* C. M. O. horizontal.

*S.*

*Pu.*

**141. Kona.**

*A.* Hawaiian Volcano Observatory, Volcano House, Hawaii, U. S. A.

*P.*

*C.-F.* 71 km west of Hawaiian Volcano Observatory.

*I.* Single Component, Volcano Observatory type.

*S.* Hawaiian Volcano Research Association and U. S. Geological Survey.

*Pu.* Hawaiian Volcano Observatory; Weekly letter and monthly bulletin.

**142. Königsberg.**

*A.* Geophysikalische Warte der Albertus-Universität, Königsberg, Preussen, Deutschland.

*P.* Karl André, Director.

*C.-F.*  $54^{\circ} 50' \text{ N}$ ;  $20^{\circ} 30' \text{ E}$ . 33 m. Loam and sand.

*I.* Wiechert, N, E and Z. Service began 1912.

*S.* Albertus-Universität, Königsberg, Pr.

*Pu.* Seismological Bulletin, Yearly.

Königstein. See Taunus, No. 304.1.

**143. Kosyun.**

*A.* Taihoku Sokko Syo, Taihoku, Taiwan (Formosa), Japan.

*P.* Y. Kawakami, Director.

*C.-F.* 22° 00' N; 120° 45' E. 22 m. Alluvium.

*I.* Omori Tromometer, E, 1907; Gray-Milne, N, E and Z, 1909.

*S.* Government of Formosa.

*Pu.* No.

**144. Ksara.**

*A.* Observatoire de Ksara, Saad-Nail, Syrie.

*P.* Ch. Combier, Director; B. Berloty, Assistant.

*C.-F.* 33° 49' N; 35° 54' E. 918 m. Solid rock.

*I.* Mainka, N and E, 1911.

*S.* Observatoire de Ksara.

*Pu.* Annales de l'Observatoire de Ksara.

**145. Kucino.**

*A.* Seismologic Station of the Geophysical Observatory of Kucino, Obiralovka near Moscow, U. S. S. R.

*P.* V. F. Bonckovskij, Official in charge.

*C.-F.* 55° 45' N; 37° 58' E. 135 m. Sand and clay.

*I.* Galitzin, N, E and Z, 1923.

*S.* State Geophysical Research Institute in Moscow; Station belongs in the net of the Academy of Sciences, Leningrad.

*Pu.* Monthly Bulletin, Kucino.

**146. Kumagaya.**

*A.* Saitamaken-Kumagaya-Sokkosyotyo, Kumagaya-Mati, Saitama-Ken, Japan.

*P.* Hirano Tadayosi, in charge.

*C.-F.* 36° 09' N; 139° 23' E. 30 m.

*I.* Wiechert, N, E, Z; Omori, N and E; Nakamura, N and E; C. M. O. type, N, E and Z, 1896.

*S.*

*Pu.*

**147. Kumamoto.**

*A.* Kumamoto Meteorological Observatory, Kumamoto, Japan.

*P.* S. Kuriyama, Director.

*C.-F.* 32° 49' N; 130° 41' E.

*I.* Omori tromometer, N and E, 1918; Wiechert, N, E and Z.

*S.*

*Pu.*

**148. Kure.**

*A.* Kure Meteorological Observatory, Kure, Japan.

*P.*

*C.-F.* 34° 14' N; 133° 33' E.

*I.* Omori portable, horizontal.

*S.*

*Pu.*

**149. Kushiro.**

*A.* Kushiro Meteorological Observatory, Kushiro, Hokkaido, Japan.

*P.*

*C.-F.*  $42^{\circ} 59' \text{ N}$ ;  $144^{\circ} 24' \text{ E}$ .

*I.* Omori portable, horizontal.

*S.*

*Pu.*

**150. Kyoto.**

*A.* Kyoto Meteorological Observatory, Kyoto, Japan.

*P.* T. Miyake, Director.

*C.-F.*  $35^{\circ} 01' \text{ N}$ ;  $135^{\circ} 44' \text{ E}$ . 42 m. Sandy clay.

*I.* Wiechert, N, E and Z, 1926; Omori, N and E, 1916; C. M. O. type, N, E and Z, 1926; Milne, N, E and Z.

*S.* Honsyu prefecture.

*Pu.* Monthly Bulletin.

**151. Kyusyu.**

*A.* Kyusyu Meteorological Observatory, Kyusyu, Japan..

*P.*

*C.-F.*  $33^{\circ} 35' \text{ N}$ ;  $130^{\circ} 23' \text{ E}$ .

*I.* Wiechert, N, E and Z.

*S.*

*Pu.*

**152. La Jolla.**

*A.* Seismological Laboratory, 220 North San Rafael Avenue, Pasadena, California, U. S. A.

*P.* Harry O. Wood, Research Associate in Seismology, Carnegie Institution of Washington.

*C.-F.*  $32^{\circ} 52' \text{ N}$ ;  $117^{\circ} 15' \text{ W}$ . 8 m. Consolidated alluvium. Depth to water unknown but is slight.

*I.* Wood-Anderson, N and E, 1927.

*S.* Carnegie Institution of Washington and Scripps Institution of Oceanography of the University of California.

*Pu.* No routine publication; *see* Pasadena.

**153. La Paz.**

*A.* Observatorio San Calixto, La Paz, Bolivia.

*P.* P. M. Descotes, Director.

*C.-F.* 16° 30' S; 68° 08' W. 3658 m. Alluvium.

*I.* Bi-filar pendulums, N and E; Vertical pendulum, 1500 kg, 1913; Galitzin, E and Z, 1929.

*S.* Colegio San Calixto; Jesuit Society.

*Pu.* Seismological Bulletin.

#### 154. La Plata.

*A.* Observatorio Astronómico, La Plata, Argentina.

*P.* Juan Hartmann, Director; Frederico Lünkenheimer, Seismologist.

*C.-F.* 34° 54' S; 57° 56' W. 72 m. Loess. 12 m to water.

*I.* Vicentini, N, E and Z; Wiechert, Z; Mainka, N and E; began 1907.

*S.* National University of La Plata.

*Pu.* Monthly Bulletin, and "Contribuciones Geofísicas," Annual.

Lassen Volcano Observatory. *See* Mineral, No. 185.

#### 155. Lawrence.

*A.* Seismograph Station, University of Kansas, Lawrence, Kansas, U. S. A.

*P.* C. T. Posey in charge.

*C.-F.* 38° 58' N; 95° 15' W. 301 m. Shale.

*I.* Wiechert, N and E, 1909.

*S.* University of Kansas.

*Pu.* No.

#### 156. Leipzig.

*A.* Erdbebenwarte des Geophysikalischen Instituts der Universität, Leipzig, C 1, Talstrasse 38 III.

*P.* Ludwig Weickmann, Director.

*C.-F.* 51° 20' N; 12° 24' E. 113 m. Gravel.

*I.* Wiechert, N and E, 1902.

*S.* Universität Leipzig.

*Pu.* 13 Berichte der Erdbebenwarte Leipzig.

#### 157. Le Mans.

*A.* Station sismologique, Le Mans, France.

*P.* Albert Jagot, in charge.

*C.-F.* 48° 00' N; 0° 13' E. 77 m. Clay.

*I.* Mainka, N and E, 1912.

*S.* City of La Mans.

*Pu.*



**158. Lemberg.**

*A.* Observatory of the Technical High School, Polytechnical Academy, Lwow (Lemberg), Poland.

*P.* L. Grabowski, Director; J. Ryzner, Adjunct.

*C.-F.*  $49^{\circ} 50' N$ ;  $24^{\circ} 01' E$ . 310 m. Sand and sandstone. 11 m to water.

*I.* Bosch-Omori, N and E. Service began 1899.

*S.* Observatory of the Technical High School, Lwow.

*Pu.* Seismological Bulletin.

**159. Leningrad.**

*A.* Seismologic Station, Physico-Mathematical Institute, Academy of Sciences, Leningrad, U. S. S. R.

*P.* P. Nikiforoff, Superintendent.

*C.-F.*  $59^{\circ} 56' N$ ;  $30^{\circ} 18' E$ . 3 m. Clay.

*I.* Galitzin, N, E and Z, 1925.

*S.* Academy of Sciences, Leningrad, U. S. S. R.

*Pu.* Monthly Bulletin, Leningrad.

Lick Observatory. *See* Mt. Hamilton, No. 199.

**160. Lima.**

*A.* Director Servicio Sismológico, Lima, Peru.

*P.* Scipion E. Llona, Director.

*C.-F.*  $12^{\circ} 03' S$ ;  $77^{\circ} 01' W$ . 154 m. Alluvium on diorite.

*I.* Wiechert, N and E; Milne, E; 1925.

*S.* Servicio Sismológico del Peru.

*Pu.* Special Publication, "Teoria Cicloidal"; second volume in preparation.

**161. Lisbon.**

*A.* Observatório Central Meteorológico, Magnético e Sismológico, Rua da Escola Politécnica, Lisboa, Portugal.

*P.* General João Maria de Almeida Lima, Officer in charge.

*C.-F.*  $38^{\circ} 43' N$ ;  $9^{\circ} 08' E$ . 78 m. Marl.

*I.* Wiechert, N, E and Z; Mainka; January, 1928.

*S.* Lisbon University.

*Pu.* Monthly bulletin and Observatory annual.

**162. Little Rock.**

*A.* Seismological Station, Little Rock College, Pulaski Heights, Little Rock, Arkansas, U. S. A.

*P.* John J. Healy, Director.

*C.-F.*  $34^{\circ} 47' N$ ;  $92^{\circ} 21' W$ . 135 m. Sandstone.

*I.* Wood-Anderson, N and E, 1931.

*S.* Little Rock College.

*Pu.* Monthly Bulletin through St. Louis University, St. Louis, Missouri.

Liverpool Observatory. *See* Bidston, No. 35.

### 163. Livorno.

*A.* Osservatorio Sismico, Livorno, Italia.

*P.* Giuseppe Schiavaghi, Director.

*C.-F.* 43° 32' N; 10° 18' E. Sea-level. Sandy rock.

*I.* Horizontal pendulums as follows: 300 kg, N and E; 500 kg, N and E; 207 kg, N and E; 100 kg, N and E; 100 kg, Z; Vertical pantografico; 2 vertical pendulums, 45 kg.

*S.* Osservatorio Geodinamico.

*Pu.* Seismological Bulletin, Rome.

### 164. Ljubljana.

*A.* Institut Météorologique de l'Université, Ljubljana, Jugoslavia.

*P.* M. Oskar Reya, Director.

*C.-F.* 46° 03' N; 14° 31' E. 300 m. Diluvium.

*I.* Wiechert, NE and NW. Service began 1897.

*S.* University of Ljubljana.

*Pu.* Annuaire Seismique, Belgrad.

Loyola University. *See* Chicago, No. 50.

Loyola University. *See* New Orleans, No. 211.

### 165. Lund.

*A.* Seismologic Station, Observatorium, Lund, Sweden.

*P.* W. Gyllenberg, Acting Director; Sture Holm, in charge.

*C.-F.* 55° 42' N; 12° 56' E. 32 m. Glacial moraines. 10 m to water.

*I.* Wiechert, NE and NW, 1917.

*S.* University of Lund.

*Pu.* Expects to publish in the Bulletin of the Seismologic Station of the Geodaetisk Institut, Copenhagen, Denmark.

Lwow. *See* Lemberg, No. 158.

Madras. *See* Kodaikanal, No. 138.

### 166. Madrid.

*A.* Jefe del Servicio Sismológico, Instituto Geográfico y Catastral, Madrid, España.

*P.* José Galbis y Rodriguez, Director.

*C.-F.*  $40^{\circ} 24' N$ ;  $3^{\circ} 41' W$ .

*I.* Wiechert, N and E.

*S.* Instituto Geográfico y Catastral.

*Pu.* Seismological Bulletin.

**167. Maebashi.**

*A.* Maebashi Meteorological Observatory, Maebashi, Japan.

*P.* K. Akaii, Director.

*C.-F.*  $36^{\circ} 24' N$ ;  $139^{\circ} 40' E$ . 112 m. Soft ground.

*I.* Omori tromometer, N and E, 1912.

*S.*

*Pu.*

**168. Makeevka.**

*A.* Seismologic Station, Makeevka, District Stalin, U. S. S. R.

*P.* A. B. Gavdenski, Official in charge.

*C.-F.*  $48^{\circ} 02' N$ ;  $37^{\circ} 59' E$ . 181 m. Sandstone.

*I.* Galitzin, N, E and Z, 1912.

*S.* Board of Public Economy of the Ukraine and Trade Commissariate of the U. S. S. R., Academy of Sciences, Leningrad.

*Pu.* Monthly Bulletin and Institut Seismologique, de l'Academie des Sciences de l'U. R. S. S., Bulletin.

**169. Malabar.**

*A.* Batavia Observatory, Java.

*P.* K. A. R. Bosscha, in charge.

*C.-F.*  $7^{\circ} 13' S$ ;  $107^{\circ} 37' E$ . 1550 m. Volcanic.

*I.* Wiechert, N and E, 1911.

*S.* Batavia Observatory, Java.

*Pu.* Seismological Bulletin, Batavia.

**170. Malaga.**

*A.* Estación Sismológica y Meteorológica de Málaga, Málaga, España.

*P.* Juan Garcia de Lomas, Director.

*C.-F.*  $36^{\circ} 44' N$ ;  $4^{\circ} 25' W$ . 60 m. Limestone.

*I.* Mainka, N and E; Wiechert, Z, 1915.

*S.* Instituto Geográfico y Catastral.

*Pu.* Monthly Bulletin, Instituto Geográfico y Catastral.

**171. Manila.**

*A.* Manila Observatory, Manila, P. I.

*P.* Miguel Selga, Director; W. C. Repetti, Chief Seismologist; Cesareo Duluena, Assistant Chief Seismologist.

*C.-F.* 14° 35' N; 120° 59' E. 3 and 10 m. Alluvium.

*I.* Wiechert, N and E, 1884; Vicentini, N, E and Z; Omori, N and E; Galitzin-Willip, N, E and Z, 1930.

*S.* Philippine Government.

*Pu.* Seismological Bulletin.

Manila Observatory. *See* Ambulong, No. 15; Baguio, No. 23; Butuan, No. 40.

**172. Manzanillo.**

*A.* Estación Sismológica de Manzanillo, Manzanillo, Mexico.

*P.* Lorenzo Fernandez, in charge.

*C.-F.* 19° 03' N; 104° 20' W. 60 m. Basalt.

*I.* Wiechert, N, E and Z, 1930.

*S.* Instituto de Geologia, 6 del Cipres, núm. 176, Mexico, D. F.

*Pu.* Catalog de los Temblores, Annual.

**173. Maron.**

*A.* Batavia Observatory, Java.

*P.*

*C.-F.* 7° 34' S; 110° 25' E. 960 m. Volcanic.

*I.* Omori Tremometer, NE, 1924.

*S.* Batavia Observatory, Java.

*Pu.* Seismological Bulletin, Batavia.

Marquette University. *See* Milwaukee, No. 183.

**174. Marseilles.**

*A.* Observatoire de Marseille, Marseille, France.

*P.* R. Baillaud and Ch. Gallinot, Astronomers.

*C.-F.* 43° 18' N; 5° 24' E. 75 m. Limestone.

*I.* Mainka, N and E, 1912.

*S.* Observatoire National.

*Pu.* Seismograms sent to Strasbourg.

Martinique, Observatoire de la. *See* Fort de France, No. 78.

**175. Matsumoto.**

*A.* Matsumoto Meteorological Observatory, Matsumoto, Japan.

*P.* I. Yanagisawa, Director.

*C.-F.* 36° 14' N; 137° 59' E. 581 m. Alluvium.

*I.* C. M. O. horizontal.

*S.*

*Pu.*

**176. Matsuyama.**

*A.* Matsuyama Meteorological Observatory, Matsuyama, Japan.

*P.* K. Hiroe, Director.

*C.-F.*  $33^{\circ} 50' N$ ;  $132^{\circ} 45' E$ . 31 m. Granitic gravel, soil.

*I.* Omori tromometer, N and E, 1911; Wiechert, N, E and Z.

*S.*

*Pu.*

**177. Mauritius.**

*A.* Royal Alfred Observatory, Mauritius.

*P.* R. A. Watson, Director.

*C.-F.*  $20^{\circ} 06' S$ ;  $57^{\circ} 33' E$ . 51 m. Soil on basalt.

*I.* Milne, N and E; 1898; not functioning since 1921.

*S.*

*Pu.*

**178. Mazatlan.**

*A.* Estación Sismológica de Mazatlán, Mazatlán, Sinaloa, Mexico.

*P.* Eduardo Schober, in charge.

*C.-F.*  $23^{\circ} 11' N$ ;  $106^{\circ} 24' W$ . 65 m. Andesite.

*I.* Wiechert, N, E and Z, 1910.

*S.* Instituto de Geología, 6 del Cipres, núm. 176, Mexico, D. F.

*Pu.* Catalog de los Temblores, Annual.

**179. Medan.**

*A.* Batavia Observatory, Java, Netherlands East Indies.

*P.*

*C.-F.*  $3^{\circ} 35' S$ ;  $98^{\circ} 41' E$ . 25 m. Quaternary.

*I.* Wiechert, N and E, 1929.

*S.* Royal Observatory, Batavia.

*Pu.* Seismological Bulletin, Batavia.

**180. Melbourne.**

*A.* Government Astronomer, Melbourne Observatory, South Yarra, SE 1, Victoria, Australia.

*P.* J. M. Baldwin, Government Astronomer; W. M. Holmes, in charge.

*C.-F.*  $37^{\circ} 50' S$ ;  $144^{\circ} 58' E$ . 26 m. Tertiary rock.

*I.* Milne-Shaw, E (Milne, discontinued; began 1900).

*S.* Government of Victoria, Australia.

*Pu.* Seismological Bulletin and Reports to Oxford, Strasbourg and Ottawa.

**181. Mera.**

*A.* Mera Meteorological Observatory, Mera, Japan.

*P.*

*C.-F.*  $34^{\circ} 55' N$ ;  $139^{\circ} 50' E$ .

*I.* Wiechert, N, E and Z.

*S.*

*Pu.*

**182. Merida.**

*A.* Estación Sismológica de Merida, Merida, Yucatan, Mexico.

*P.* Rafael Acosta Ocampo, in charge.

*C.-F.*  $20^{\circ} 57' N$ ;  $89^{\circ} 37' W$ . 6 m. Limestone.

*I.* Wiechert, N, E and Z, 1912.

*S.* Instituto de Geología, 6 del Cipres, num. 176, Mexico, D. F.

*Pu.* Catalog de los Temblores, Annual.

Mexico City. *See* Tacubaya, No. 295.

Michigan, University of. *See* Ann Arbor, No. 17.

**183. Milwaukee.**

*A.* Marquette University Seismological Station, Marquette University, Milwaukee, Wisconsin, U. S. A.

*P.* A. H. Poetker, Director; J. C. Cantwell, Assistant.

*C.-F.*  $43^{\circ} 02' N$ ;  $87^{\circ} 55' W$ . 194 m. Alluvium.

*I.* Wiechert, N and E, 1909.

*S.* Marquette University.

*Pu.* Jesuit Seismological Station Bulletin, St. Louis, Mo.

**184. Mineo.**

*A.* Osservatorio Geofisico, Mineo, Italy.

*P.* Corrado Guzzanti, Director.

*C.-F.*  $37^{\circ} 15' N$ ;  $14^{\circ} 44' E$ . 510 m. Pliocene.

*I.* Guzzanti, N and E; Brassart; Agamennone, N and E.

*S.* Osservatorio Geofisica Guzzanti.

*Pu.*

**185. Mineral.**

*A.* Lassen Volcano Observatory, Mineral, California, U. S. A.

*P.* R. H. Finch, Associate Volcanologist.

*C.-F.*  $40^{\circ} 21' N$ ;  $121^{\circ} 35' W$ . 1504 m. 3 m to water.

*I.* Hawaiian Volcano Observatory type, N and E, 1926.

*S.* U. S. Geological Survey.

*Pu.* Hawaiian Volcano Observatory, Weekly Letter and Monthly Bulletin.

**186. Misaki.**

A. Misaki Seismological Station, Miura Penins., Kanagawa, Japan.

P.

C.-F.  $35^{\circ} 10' N$ ;  $139^{\circ} 38' E$ . Tertiary.

I. No. 1, N and E.

S. Tokyo Imperial University.

Pu. See Tokyo.

**187. Misima.**

A. Misima Meteorological Observatory, Misima, Japan.

P.

C.-F.  $35^{\circ} 07' N$ ;  $138^{\circ} 55' E$ .

I. Wiechert, N, E and Z.

S.

Pu.

**188. Mitaka.**

A. Mitaka Seismological Station, Tokyo Imperial University Astronomical Observatory, Mitaka, Japan.

P.

C.-F.  $35^{\circ} 59' N$ ;  $139^{\circ} 05' E$ .

I. No. 1, N and E; No. 2, N and E.

S. Tokyo Imperial University.

Pu. See Tokyo.

**189. Mito.**

A. Mito Meteorological Observatory, Mito, Japan.

P. H. Uno, Director.

C.-F.  $36^{\circ} 23' N$ ;  $140^{\circ} 28' E$ . 30 m. Hilly ground.

I. Omori tromometer, N and E, 1905.

S.

Pu.

**190. Miyako.**

A. Miyako Meteorological Observatory, Miyako, Japan.

P.

C.-F.  $39^{\circ} 38' N$ ;  $141^{\circ} 59' E$ .

I. C. M. O. horizontal

S.

Pu.

**191. Miyatsu.**

A. Miyatsu Meteorological Observatory, Miyatsu, Japan.

P.

*C.-F.*  $35^{\circ} 32' \text{ N}$ ;  $135^{\circ} 12' \text{ E}$ .

*I.* Omori portable, horizontal.

*S.*

*Pu.*

**192. Miyazaki.**

*A.* Miyazaki Meteorological Observatory, Miyazaki, Japan.

*P.* K. Itonaga, Director.

*C.-F.*  $31^{\circ} 55' \text{ N}$ ;  $131^{\circ} 25' \text{ E}$ . 8 m. Quaternary. 3 m to water.

*I.* Wiechert, N, E and Z; Omori, N and E (two sets); C. M. O. type, N, E and Z, 1889.

*S.* Miyazaki Ken Prefecture.

*Pu.* Monthly Bulletin.

**193. Mizusawa.**

*A.* International Latitude Observatory of Mizusawa, Iwateken, Japan.

*P.* H. Kimura Rigakuhakushi, Director.

*C.-F.*  $39^{\circ} 08' \text{ N}$ ;  $141^{\circ} 08' \text{ E}$ . 61 m. Clay. 4 m to water.

*I.* Omori tromometer, N and E, 1902.

*S.* Iwateken Prefecture, Department of Education.

*Pu.* Annual report of the observatory.

**194. Mobile, Alabama.**

*A.* Seismic Observatory, Spring Hill College, Spring Hill, Mobile County, Alabama, U. S. A.

*P.*

*C.-F.*  $30^{\circ} 42' \text{ N}$ ;  $88^{\circ} 09' \text{ W}$ . 60 m. Alluvium.

*I.* Wiechert, N and E, 1910.

*S.* Spring Hill College.

*Pu.*

**195. Moncalieri.**

*A.* Osservatorio Sismico, Moncalieri, Turin, Italia.

*P.* G. Penta, Director.

*C.-F.*  $45^{\circ} 00' \text{ N}$ ;  $7^{\circ} 42' \text{ E}$ . 238 m. Alluvium. 15 m to water.

*I.* Stiattesi, N and E; Horizontal Pendulum, ENE; Vertical Pendulum, 1906

*S.* Real Collegio Carlo Alberto.

*Pu.* Annual Bulletin.

**196. Montecassino.**

*A.* Osservatorio Geofisico de Montecassino, Montecassino, Italia.

*P.* Bernardo M. Paoloni, Director.



*C.-F.* 41° 29' N; 13° 49' E. 540 m. Limestone.

*I.* Cancani, N and E; Agamennone, N, E and Z; 1909.

*S.*

*Pu.* Weekly Bulletin, R. Uff. Centrale di Meteorologia e Geofisica, Roma (*See* Naples); and the Montecassino Review, 6 times a year.

**197. Morioka.**

*A.* Morioka Meteorological Observatory, Morioka, Japan.

*P.*

*C.-F.* 39° 42' N; 141° 09' E.

*I.* Wiechert, N, E and Z.

*S.*

*Pu.*

**198. Mostar.**

*A.* Observatoire Meteorologique, Mostar, Hercegovine, Yougoslavie.

*P.* M. Adolf Klinger, Director.

*C.-F.* 43° 21' N; 17° 49' E. 70 m. Diluvium.

*I.* Vicentini.

*S.* Institut Seismologique de Belgrade.

*Pu.* Annuaire Seismique, Seismological Institute, University of Belgrade.

**199. Mt. Hamilton.**

*A.* Lick Observatory Seismologic Station, Mt. Hamilton, California, U. S. A.

*P.* R. G. Aitken, Associate Director, Lick Observatory; R. J. Trumpler, Associate Astronomer, Lick Observatory; Perry Byerly, Assistant Professor of Seismology, University of California, in charge of seismometric measurements.

*C.-F.* 37° 20' N; 121° 39' W. 1282 m. Feldspathic sandstone.

*I.* Wiechert, N, E and Z, 1911; Duplex Pendulum Seismograph; Ewing, N, E and Z; Wood-Anderson, N and E, 1928; Service began 1887.

*Pu.* Bulletin of the Seismological Stations, Berkeley, California.

**200. Mount Wilson.**

*A.* Seismological Laboratory, 220 North San Rafael Avenue, Pasadena, California, U. S. A.

*P.* Harry O. Wood, Research Associate in Seismology, Carnegie Institution of Washington.

*C.-F.*  $34^{\circ} 13' N$ ;  $118^{\circ} 03' W$ . 1742 m. Granite. Depth to water unknown, probably great.

*I.* Wood-Anderson, N and E, 1928.

*S.* Carnegie Institution of Washington.

*Pu.* No routine publication; *see* Pasadena.

**201. Munich.**

*A.* Erdphysikalische Warte b. d. Sternwarte, München 27, Sternwarte, München, Deutschland.

*P.* A. Wilkens, Director; C. W. Lutz, Chief Observer; F. Burmeister, Observer.

*C.-F.*  $48^{\circ} 09' N$ ;  $11^{\circ} 37' E$ . 528 m. Glacial drift. 12 m to water.

*I.* Wiechert, N and E, 1905.

*S.* Supported by government.

*Pu.* Reports sent to Jena.

**202. Muroran.**

*A.* Muroran Meteorological Observatory, Muroran, Hokkaido District, Japan.

*P.*

*C.-F.*  $42^{\circ} 20' N$ ;  $140^{\circ} 57' E$ .

*I.* C. M. O. horizontal.

*S.*

*Pu.*

**203. Muroto.**

*A.* Muroto Meteorological Observatory, Muroto, Sikoku District, Japan.

*P.*

*C.-F.*  $33^{\circ} 15' N$ ;  $134^{\circ} 11' E$ .

*I.* Omori portable, horizontal.

*S.*

*Pu.*

**204. Nagano.**

*A.* Nagano Meteorological Observatory, Nagano, Japan.

*P.* M. Kadima, Director.

*C.-F.*  $36^{\circ} 40' N$ ;  $138^{\circ} 12' E$ . 418 m. Clay. 5 m to water.

*I.* Wiechert, N, E and Z; Omori, N and E; Portable, N and E; Strong motion, N, E and Z, 1903.

*S.* Nagano prefecture.

*Pu.* No publications in foreign languages.

**205. Nagasaki.**

A. Nagasaki Meteorological Observatory, Nagasaki, Japan.

P. I. Goto, Director.

C.-F.  $32^{\circ} 44' \text{ N}$ ;  $129^{\circ} 53' \text{ E}$ . 131 m. Volcanic agglomerate.

I. Omori tromometer, N and E; Imamura, N and E; Omori seismograph, N, E and Z, 1913; Wiechert, N, E and Z.

S.

Pu.

**206. Nagoya.**

A. Aiti-ken Meteorological Observatory, Nagoya, Japan.

P. Y. Yosida, Director; H. Yosikawa, Assistant.

C.-F.  $35^{\circ} 10' \text{ N}$ ;  $136^{\circ} 58' \text{ E}$ . 52 m. Clay. 20 meters to water.

I. Wiechert, N, E and Z; Omori, N and E, 1910.

S. Aiti prefecture.

Pu. Monthly and annual bulletins.

**207. Naples.**

A. Geophysical Institute of the R. University, 10 Large S. Marcellino, Italy.

P. Giovanni Battista Rizzo, Director; Ester Majo, Assistant.

C.-F.  $40^{\circ} 51' \text{ N}$ ;  $14^{\circ} 16' \text{ E}$ . 20 m. Volcanic tuff.

I. Vicentini, N, E and Z; Wiechert and Milne-Shaw to be installed; began 1861.

S. The R. University of Naples.

Pu. Publications of the R. Ufficio Centrale di Meteorologia e Geofisica, Roma.

See also Valle di Pompeii, No. 333.

**208. Nase.**

A. Nase Meteorological Observatory, Nase, Okinawa Islands, Japan.

P.

C.-F.  $28^{\circ} 23' \text{ N}$ ;  $129^{\circ} 30' \text{ E}$ .

I. Wiechert, N, E and Z.

S.

Pu.

**209. Nemuro.**

A. Nemuro Meteorological Observatory, Nemuro, Hokkaido District, Japan.

P.

C.-F.  $42^{\circ} 59' \text{ N}$ ;  $144^{\circ} 24' \text{ E}$ .

*I.* Omori portable, horizontal.

*S.*

*Pu.*

Nevada, University of. *See* Reno, No. 248.

### 209.1 Neuchatel.

*A.* Station sismique, Observatoire de Neuchatel, Switzerland.

*P.* Louis Arndt, Director.

*C.-F.*  $47^{\circ} 00' N$ ;  $6^{\circ} 56' E$ . 488 m. Rock.

*I.* Quervain-Piccard, N, E and Z; Mainka, N and E, 1911.

*S.*

*Pu.* Publications of the Observatory of Neuchatel.

### 210. New Haven.

*A.* Yale Seismograph Station, Peabody Museum, Yale University, New Haven, Connecticut, U. S. A.

*P.* Fred C. Herpich, in charge.

*C.-F.*  $41^{\circ} 19' N$ ;  $72^{\circ} 54' W$ . 11 m. Piers 8 meters to sandstone.

*I.* Bosch-Omori, N and E, 1925.

*S.* Yale University.

*Pu.* No.

### 211. New Orleans.

*A.* Nicholas D. Burke Seismic Observatory, Loyola University, New Orleans, Louisiana, U. S. A.

*P.* O. L. Abell, Director; T. Carter, Assistant.

*C.-F.*  $29^{\circ} 57' N$ ;  $90^{\circ} 07' W$ . 2 m. Alluvial. Pier of concrete.

Floor of building rests on 60 ft. piles.

*I.* Wiechert, N, E and Z, 1910.

*S.* Loyola University, New Orleans, Louisiana.

*Pu.* Jesuit Seismological Association Bulletin, St. Louis, Missouri.

New York, N. Y. *See* Fordham, No. 77.

New York State Museum. *See* Albany, No. 8.

### 212. Niigata.

*A.* Niigata Meteorological Observatory, No. 5932 Hamaura Nishfunami St., Niigata, Japan.

*P.* T. Sasaki, Director.

*C.-F.*  $37^{\circ} 56' N$ ;  $139^{\circ} 03' E$ . 7 m. Sand. 8 m to water.

*I.* Omori tromometer, N and E; Imamura, N, E and Z; 1893.

*S.* Niigata prefecture.

*Pu.* Annual report.

**213. Niihama.**

A. Niihama Meteorological Observatory, Niihama, Sikoku District, Japan.

P.

C.-F.  $33^{\circ} 58' N$ ;  $133^{\circ} 16' E$ .

I. Omori portable, horizontal.

S.

Pu.

Nizamiah Observatory. *See* Hyderabad, No. 113.

**214. Nördlingen.**

A. Erdbebenwarte Nördlingen, Bayern, Germany.

P. Otto Aumüller, in charge.

C.-F.  $48^{\circ} 51' N$ ;  $10^{\circ} 29' E$ . 432 m. Limestone.

I. Mainka, E, 1911.

S. Sternwarte München.

Pu. Reports sent to Jena.

**215. Numazu.**

A. Numazu Meteorological Observatory, Numazu, Japan.

P.

C.-F.  $35^{\circ} 06' N$ ;  $138^{\circ} 51' E$ . 6 m. Soft ground.

I. Wiechert, N, E and Z; Omori Seismograph, N and E.

S.

Pu. Monthly Bulletin.

**216. Oaxaca.**

A. Estación Sismológica de Oaxaca, Mexico.

P. Alfonso Rueda, in charge.

C.-F.  $17^{\circ} 01' N$ ;  $96^{\circ} 46' W$ . 1571 m. Tufa.

I. Wiechert, N, E and Z, 1910.

S. Instituto de Geología, 6 del Cipres, núm. 176, Mexico, D. F.

Pu. Catalog de los Temblores, Annual.

**217. Obihiro.**

A. Obihiro Meteorological Observatory, Obihiro, Hokkaido District, Japan.

P.

C.-F.  $42^{\circ} 55' N$ ;  $142^{\circ} 13' E$ .

I. C. M. O. horizontal.

S.

Pu.

Observatoire météorologique du Seminaire St. Martial. *See* Port-au-Prince, No. 240.

Observatoire National d'Athens. *See* Athens, No. 21.

Observatorio Nacional de San Bartolomé. *See* Bogota, No. 37.

Observatorio San Calixto. *See* La Paz, No. 153.

**218. Oiwake.**

A. Oiwake Meteorological Observatory, Oiwake, Japan.

P.

C.-F.  $36^{\circ} 20' N$ ;  $138^{\circ} 33' E$ .

I. Omori portable, horizontal.

S.

Pu.

**219. Okayama.**

A. Okayama Meteorological Observatory, Okayama, Japan.

P.

C.-F.  $40^{\circ} 40' N$ ;  $132^{\circ} 54' E$ .

I. C. M. O. type.

S.

Pu.

**220. Okinawa.**

A. Okinawa Meteorological Observatory, Okinawa, Okinawa Islands, Japan.

P.

C.-F.  $26^{\circ} 12' N$ ;  $127^{\circ} 39' E$ .

I. Wiechert, N, E and Z.

S.

Pu.

**221. Onahama.**

A. Onahama Meteorological Observatory, Onahama, Japan.

P.

C.-F.  $36^{\circ} 56' N$ ;  $140^{\circ} 54' E$ .

I. Nakamura seismometer, horizontal.

S.

Pu.

**222. Ooita.**

A. Ooita Meteorological Observatory, Ooita, Kyusyu District, Japan.

P.

C.-F.  $33^{\circ} 14' N$ ;  $131^{\circ} 37' E$ .

I. Omori portable, horizontal.

S.

Pu.

**223. Ootomari.**

A. Ootomari Meteorological Observatory, Karafuto, Japan.

P. T. Noda, Director; T. Yosioka, Chief Observer.

C.-F.  $46^{\circ} 39' N$ ;  $142^{\circ} 46' N$ . 36 m. Tertiary. 24 m to water.

I. Omori, E; Portable, N and E; Omori tromometer, N; 1911.

S. Karafuto prefecture.

Pu. Annual and temporary reports.

Ootomari Meteorological Observatory. *See also* Sikka, No. 276.

**224. Osaka.**

A. Osaka Meteorological Observatory. Osaka, Japan.

P.

C.-F.  $34^{\circ} 39' N$ ;  $135^{\circ} 33' E$ . 3 m. Sandy loam.

I. Omori tromometer, N and E; Omori, N and Z; Omori portable, N and E; Omori Strong-motion, N, E and Z; Imamura Strong Motion, N, E and Z; Omori Clinometer, N and E; Wiechert, N, E and Z.

S. Meteorological Observatory.

Pu. Quarterly Bulletin, Japanese and English.

Osservatorio Simbruino. *See* Subiaco, No. 286.

Osservatorio Ximeniano. *See* Florence, No. 73.

**225. Ottawa.**

A. The Director, Dominion Observatory, Ottawa, Canada.

P. R. Meldrum Stewart, Director; Ernest A. Hodgson, Chief, Division of Seismology; W. W. Doxsee, Assistant Seismologist.

C.-F.  $45^{\circ} 24' N$ ;  $75^{\circ} 43' W$ . 83 m. Boulder clay over limestone. 7 m to water.

I. Bosch-Photographic, N and E; Milne-Shaw, N and E; Wiechert, Z; service began in 1906.

S. Department of the Interior, Dominion Government.

Pu. Dominion Observatory, Seismological Bulletin.

**226. Oxford.**

A. University Observatory, Oxford, England.

P. J. S. Hughes.

C.-F.  $51^{\circ} 46' N$ ;  $1^{\circ} 15' W$ . 61 m. Gravel.

I. Milne-Shaw, N and E, 1918.

S. University of Oxford; British Association.

Pu. International Seismological Summary.

**227. Padova (Padua).**

*A.* Istituto di Fisica, Padova, Italia.

*P.* G. Vicentini.

*C.-F.*  $45^{\circ} 24' N$ ;  $11^{\circ} 52' E$ . 111 m. Alluvium.

*I.* Vicentini.

*S.* Istituto di Fisica, Royal University of Padova.

*Pu.* Seismological Bulletin.

**228. Palo Alto.**

*A.* Branner Seismograph Station, Stanford University, California, U. S. A.

*P.* S. D. Townley, in charge.

*C.-F.*  $37^{\circ} 25' N$ ;  $122^{\circ} 11' W$ . 83 m. Solid rock.

*I.* Wood-Anderson, N and E.

*S.* Stanford University and University of California; seismograms analyzed at University of California by Perry Byerly.

*Pu.* Bulletin of the Seismograph Stations, Berkeley, California.

**229. Parc Saint-Maur.**

*A.* Observatoire du Parc Saint-Maur, Seine, France.

*P.* C. E. Brazier, Director; L. Elbe, in charge.

*C.-F.*  $48^{\circ} 48' N$ ;  $2^{\circ} 37' E$ . 50 m. Limestone.

*I.* Wiechert, N and E; Mainka, N and E; Galitzin, N, E and Z; 1908.

*S.* University of Paris.

*Pu.* Monthly Bulletin.

**230. Pasadena.**

*A.* Seismological Laboratory, 220 North San Rafael Avenue, Pasadena, California, U. S. A.

*P.* Harry O. Wood, Research Associate in Seismology, Carnegie Institution of Washington; Charles F. Richter, Assistant; Hugo Benioff, Assistant.

*C.-F.*  $34^{\circ} 09' N$ ;  $118^{\circ} 10' W$ . 295 m. Granite. Depth to water unknown, probably great.

*I.* Wood-Anderson, N and E ( $V=1400$ ); Wood-Anderson, N and E ( $V=400$ ). 1923; new station, 1927.

*S.* Carnegie Institution of Washington and California Institute of Technology.

*Pu.* No routine publication; special publications in Bulletin of the Seismological Society of America, Physical Review, etc.

**231. Pavia.**

*A.* R. Osservatorio Geofisico, Pavia, Italia.

*P.* Pericle Gamba, Director.



*C.-F.*  $45^{\circ} 11' N$ ;  $9^{\circ} 10' E$ . 78 m.

*I.* Vicentini; Galitzin, 1891.

*S.* Ministero Economia Nazionale.

*Pu.* R. Ufficio Centrale di Meteorologia e Geofisica, Roma; Annual.

### 232. Perth.

*A.* The Perth Observatory, Perth, Western Australia.

*P.* H. B. Ciulewis.

*C.-F.*  $31^{\circ} 57' S$ ;  $115^{\circ} 50' E$ . 60 m. Sand and limestone. 55 m to water.

*I.* Milne, 1900; Milne-Shaw, N, 1923.

*S.* Chief Secretary's Department, Government of Western Australia.

*Pu.* Seismological Bulletin and International Seismological Summary, Oxford, England.

Physikalisches Institut der Preussischen Bergakademie Clausthal. *See* Clausthal, No. 56.

### 233. Piacenza.

*A.* Osservatorio Sismico-Meteorologico, Colegio Alberoni, Piacenza, Italia.

*P.* Pietro Andreoli; Giuseppe Zeppieri.

*C.-F.*  $45^{\circ} 02' N$ ;  $9^{\circ} 44' E$ . 53 m. Alluvium.

*I.* Wiechert, N and E; Vicentini, N, E and Z; Agamennone, NE and NW.

*S.* Colegio Alberoni.

*Pu.* Not yet.

### 234. Piatigorsk.

*A.* Seismologic Station, Alexandrovskaya, Piatigorsk, Northern Caucasus, U. S. S. R.

*P.* A. N. Ogilvie, Official in charge.

*C.-F.*  $44^{\circ} 02' N$ ;  $43^{\circ} 04' E$ . 497 m. Alluvial clay.

*I.* Galitzin, N and E. 1909.

*S.* Academy of Sciences of U. S. S. R., Leningrad.

*Pu.* Bulletin, Leningrad.

### 235. Pic du Midi.

*A.* Observatoire du Pic du Midi, Bagnères de Bigorre, Hautes Pyrenees, France.

*P.* C. Dausere, Director

*C.-F.*  $42^{\circ} 56' N$ ;  $0^{\circ} 08' E$ . 2859 m. Alluvium.

*I.* Mainka, N and E, 1924.

*S.* University of Toulouse.

*Pu.* Monthly Bulletin, Strasbourg.

**236. Plauen.**

*A.* Erdbebenstation, Plauen i. Vogtland, Sachsen, Deutschland.

*P.* E. Weise, in charge.

*C.-F.*  $50^{\circ} 30' N$ ;  $12^{\circ} 09' E$ . 380 m. Breccia.

*I.* Wiechert, N, 1905.

*S.* University of Leipzig.

*Pu.* Reports sent to Leipzig.

**237. Plymouth.**

*A.* H. W. Fisher, 2 West Hoe Terrace, Plymouth, England.

*P.* Herbert W. Fisher, Owner and Operator.

*C.-F.*

*I.* Horizontal Pendulum, local construction; 1924.

*S.* Private property.

*Pu.* Reports to Oxford.

**238. Point Loma.**

*A.* Theosophical University, Point Loma, California, U. S. A.

*P.* Charles M. Savage, Cooperative Observer; H. Percy Leonard, Assistant.

*C.-F.*  $32^{\circ} 43' N$ ;  $117^{\circ} 15' W$ . 91 m. Aeolian hard pan on sandstone.

*I.* West astatic pendulum, N and E; local instrument, Z; service began in 1906.

*S.* Theosophical University.

*Pu.* Seismological report, semi-annual.

**239. Ponta Delgada.**

*A.* Servico Meteorologico dos Açores, Ponta Delgada, Açores.

*P.* J. Agostinho, Director.

*C.-F.*  $37^{\circ} 44' N$ ;  $25^{\circ} 41' W$ . 16 m. Basalt.

*I.* Milne, E, 1902.

*S.* Portuguese Government.

*Pu.* Reports to Strasbourg; and Meteorological Service of the Azores, Annual.

**240. Port-au-Prince.**

*A.* Observatoire météorologique du Seminaire St. Martial, Port-au-Prince, Haiti.

*P.* R. Baltenweck, Director.

*C.-F.*  $18^{\circ} 33' N$ ;  $72^{\circ} 20' W$ . 26 m. Calcareous tufa.

*I.* Bosch-Omor, NE and NW, 1911.

*S.* Seminaire-Collège St. Martial.

*Pu.* Observatory Bulletin, Annual.

**241. Potsdam.**

*A.* Geodätisches Institut, Potsdam, Germany.

*P.* R. Berger and K. Jung.

*C.-F.*  $52^{\circ} 23' N$ ;  $13^{\circ} 04' E$ . 80 m. Sand.

*I.* Wiechert, N and E; Galitzin-Wilip instruments being installed.

*S.* Des Preussischen Geodätischen Instituts.

*Pu.* Seismological Bulletin, Annual.

**242. Poughkeepsie.**

*A.* Vassar College, Department of Geology, Poughkeepsie, New York, U. S. A.

*P.* Thomas M. Hills; L. D. Burling.

*C.-F.*  $41^{\circ} 43' N$ ;  $73^{\circ} 55' W$ .

*I.* Wiechert, N and E; not functioning at present.

*S.* Vassar College.

*Pu.* No.

**243. Prague (Praha).**

*A.* Institut Geophysique National Tschechoslovaque, Praha, Czechoslovakia.

*P.* Vaclav Laska, Director.

*C.-F.*

*I.* Wiechert, N and E.

*S.* National Geodetic Institute of Czechoslovakia.

*Pu.* Annual Bulletin.

**244. Puebla.**

*A.* Estación Sismológica del Colegio del Estado, Puebla, Mexico.

*P.* Francisco Tenorio, in charge.

*C.-F.*  $19^{\circ} 02' N$ ;  $90^{\circ} 12' W$ . 2162 m. Basalt.

*I.* Wiechert, N and E; Milne, N, E and Z, 1920.

*S.* Instituto de Geología, 6 del Cipres, núm. 176, Mexico, D. F.

*Pu.* Catalog de los Temblores, Annual.

**245. Pulvoko.**

*A.* Seismologic Station, Pulvoko (near Leningrad), U. S. S. R.

*P.* P. Nikiforoff, Director.

*C.-F.*  $59^{\circ} 46' N$ ;  $30^{\circ} 19' E$ . 65 m. Clay.

*I.* Galitzin, N, E and Z.

*S.* Academy of Sciences, U. S. S. R., Leningrad.

*Pu.* Monthly Bulletin, Pulvoko; and Bulletin of Academy of Sciences, Leningrad.

Quarto-Castello. See Florence, No. 74.

**246. Quito.**

A. Observatorio Astronomico y Meteorologico, Apartado 165, Quito, Ecuador, S. America.

P. Luis Eduardo Mena, in charge.

C.-F.  $0^{\circ} 14' S$ ;  $78^{\circ} 32' W$ . 2908 m.

I. Mainka seismographs being installed.

S. Ministerio de Instruccion Publica.

Pu. No.

**247. Ravensburg.**

A. Erdbebenwarte, Ravensburg, Württemberg, Deutschland.

P. Prof. Dr. Hoffman, Director.

C.-F.  $47^{\circ} 47' N$ ;  $9^{\circ} 37' E$ . 400 m. Glacial sand.

I. Mainka, N and E; Conrad, N; 1914.

S. Württemberg Statistisches Landesamt, Stuttgart.

Pu. Hohenheim and Ravensburg Bulletin, semi-annual.

Real Academia de Ciencias y Artes. *See* Barcelona, No. 26.

Regio Osservatorio Geofisico. *See* Pavia, No. 231.

Regio Osservatorio Astrofisico. *See* Florence, No. 74.

Regis College Seismic Station. *See* Denver, No. 67.

**248. Reno.**

A. University of Nevada, Department of Geology, Reno, Nevada.  
U. S. A.

P. J. Claude Jones, Professor of Geology, in charge.

C.-F.  $39^{\circ} 32' N$ ;  $119^{\circ} 48' W$ . 1388 m. Alluvium.

I. Wiechert, N and E; Ewing duplex; 1911.

S. University of Nevada.

Pu. No.

**249. Reykjavik.**

A. School of Navigation, Veourstofan, Reykjavik, Iceland.

P. Thorkell Thorkelsson, Director.

C.-F.  $64^{\circ} 09' N$ ;  $21^{\circ} 57' W$ . 25 m. Doleritic rock.

I. Mainka, N and E, 1909.

S. Meteorological Office of Iceland.

Pu. Seismological Bulletin.

Richmond. *See* Kew, No. 133.

**250. Rio de Janeiro.**

A. Observatorio Nacional, Rio de Janeiro, Brazil.

P. Alix Lemos, Director; Gualter Macedo Soares, Assistant.

C.-F.  $22^{\circ} 54' S$ ;  $43^{\circ} 13' W$ . 29 m. Gneiss.

*I.* Mainka, N; Milne-Shaw, E, began 1906.

*S.* Observatorio Nacional.

*Pu.* Observatory publications; Seismological Bulletin.

**251. Riverside.**

*A.* Seismological laboratory, 220 North San Rafael Avenue, Pasadena, California, U. S. A.

*P.* Harry O. Wood, Research Associate in Seismology, Carnegie Institution of Washington.

*C.-F.*  $34^{\circ} 00' N$ ;  $117^{\circ} 22' W$ . 250 m. Granite. Depth to water unknown; probably great.

*I.* Wood-Anderson, N and E; 1926.

*S.* Carnegie Institution of Washington and City of Riverside, Calif.

*Pu.* No routine publication; see Pasadena.

**252. Riverview.**

*A.* Riverview College Observatory, Sydney, New South Wales, Australia.

*P.* Edward Francis Pigot, Director.

*C.-F.*  $33^{\circ} 50' S$ ;  $151^{\circ} 10' E$ . 42 m. Triassic sandstone.

*I.* Wiechert, N, E and Z, 1909; Mainka, N and E, 1910; Galitzin, N, E and Z, 1925.

*S.* Observatory and Government of New South Wales.

*Pu.* Seismological Bulletin.

**253. Rocca di Papa.**

*A.* R. Osservatorio Geofisico di Rocca di Papa, presso Roma, Italia.

*P.* Giovanni Agamennone, Director.

*C.-F.*  $41^{\circ} 46' N$ ;  $12^{\circ} 43' E$ . 760 m. Lava.

*I.* Agamennone, 200 kg, N and E; Agamennone, 3000 kg, N; Agamennone universal microseismometrograph, N, E and Z; Agamennone seismometrograph 200 kg, N and E; Brassart seismometrograph, N, E and Z; Agamennone, 2 kg, macroseismograph, N, E and Z; various seismoscopes. Began 1889.

*S.* R. Ufficio Centrale di Meteorologia e Geodinamica, Roma.

*Pu.*

**254. Rome.**

*A.* R. Ufficio Centrale di Meteorologia e Geodinamica, Via Caravita, No. 7, Roma, Italia.

*P.* Luigi Palazzo, Director.

*C.-F.*  $41^{\circ} 54' N$ ;  $12^{\circ} 29' E$ . 30 m. Quaternary.

*I.* Agamennone, 50 kg., NE and NW, 1909.

*S.* Collegio Roma.

*Pu.*

Royal Alfred Observatory. *See* Mauritius, No. 177.

Royal Netherlands Meteorological Institute. *See* DeBilt, No. 64.

Royal Observatory. *See* Cape of Good Hope, No. 42.

**255. Saga.**

*A.* Saga Meteorological Observatory, Saga, Japan.

*P.* K. Miyazima, Director.

*C.-F.*  $33^{\circ} 12' N$ ;  $130^{\circ} 18' E$ . 12 m. Soft ground.

*I.* Omori, horizontal.

*S.*

*Pu.*

**256. St. Boniface.**

*A.* Observatoire sismologique du College de Saint Boniface, Saint Boniface, Manitoba, Canada.

*P.*

*C.-F.*  $49^{\circ} 54' N$ ;  $97^{\circ} 07' W$ . 230 m. Shale.

*I.* Wiechert, N and E, 1910; Instruments destroyed by fire in 1922.

*S.* College de St. Boniface.

*Pu.* No.

**257. St. Helena Island.**

*A.* The Eastern Telegraph Co., Ltd., The Briars, Island of St. Helena.

*P.* The Superintendent, Eastern Telegraph Co., in charge.

*C.-F.*  $15^{\circ} 55' S$ ;  $5^{\circ} 44' W$ . 274 m. Volcanic material.

*I.* Milne, E, 1907.

*S.* The Eastern Telegraph Company.

*Pu.* Reports to University Observatory, Oxford, England.

**258. St. Louis.**

*A.* Seismographic Station, St. Louis University, 221 North Grand Boulevard, St. Louis, Missouri, U. S. A.

*P.* James B. Macelwane, Director; J. S. Joliat, George E. Rueppel, Alfred E. Zeller, Cornelius G. Dahm.

*C.-F.*  $38^{\circ} 38' N$ ;  $90^{\circ} 14' W$ . 161 m. Limestone.

*I.* Wiechert, N and E, 1909; Wood-Anderson, N and E, 1927.

*S.* St. Louis University.

*Pu.* Monthly Bulletin; Preliminary report on Epicenters.

St. Louis University. *See* Florissant, No. 75.

St. Xavier College. *See* Cincinnati, No. 55.

Saitamaken-Kumagaya-Sokkosyotyo. *See* Kumagaya, No. 146.

**259. Sakai.**

*A.* Sakai Meteorological Observatory, Sakai, Japan.

*P.*

*C.-F.*  $35^{\circ} 33' N$ ;  $133^{\circ} 14' E$ .

*I.* Omori portable, horizontal.

*S.*

*Pu.*

**260. Samarkand.**

*A.* Seismologic Station, Vseobuch Boulevard 8, Samarkand, Turkestan, U. S. S. R.

*P.* M. P. Repnikov, Official in charge.

*C.-F.*  $39^{\circ} 39' N$ ;  $66^{\circ} 52' E$ . Alluvium.

*I.* Galitzin mechanical registration, N and E, 1913.

*S.* Uzbekistan Scientific Center.

*Pu.* No publication.

**261. San Fernando.**

*A.* Instituto y Observatorio de Marina, San Fernando (Cadiz), España.

*P.* Leon Herrero y Garcia, Director. Salvador de Matos Sestelo, in charge.

*C.-F.*  $36^{\circ} 28' N$ ;  $6^{\circ} 12' W$ . 28 m. Calcareous rock.

*I.* Milne, N and E; Bifilar pendulum, N, N and E; Vertical pendulum; 1928.

*S.* Government of Spain.

*Pu.* Monthly Bulletin.

**262. San Juan.**

*A.* San Juan Magnetic Observatory, Box 3067, San Juan, Porto Rico, U. S. A.

*P.* Eoline R. Hand, Officer in charge; James W. Roberts, Assistant.

*C.-F.*  $18^{\circ} 23' N$ ;  $66^{\circ} 07' W$ . 80 m. Broken limestone.

*I.* Bosch-Omeri, N and E, 1926 (Discontinued, 1928); Wenner, N and E, 1930.

*S.* U. S. Coast and Geodetic Survey, Washington, D. C., U. S. A.

*Pu.* Monthly Report; Earthquakes of the United States, Annual.

**263. Santa Barbara.**

A. Seismological Laboratory, 220 North San Rafael Avenue, Pasadena, California, U. S. A.

P. Harry O. Wood, Research Associate in Seismology, Carnegie Institution of Washington.

C.-F.  $34^{\circ} 27' N$ ;  $119^{\circ} 43' W$ . 100 m. Heavy alluvium. Depth to water unknown but probably slight.

I. Wood-Anderson, N and E, 1927.

S. Carnegie Institution of Washington and Santa Barbara Museum of Natural History.

Pu. No routine publication; see Pasadena.

**264. Santa Clara.**

A. Observatory, Santa Clara University, Santa Clara, California, U. S. A.

P. Jerome S. Ricard, Director; Albert J. Newlin.

C.-F.  $37^{\circ} 21' N$ ;  $121^{\circ} 57' W$ . 28 m. Sand and gravel. 28 m to water.

I. Wiechert, N, E and Z, 1909; expecting to install Galitzin instruments.

S. University of Santa Clara.

Pu. Jesuit Seismological Association, Monthly Bulletin, St. Louis, Mo.

**265. Santiago.**

A. Servicio Sismológico de Chile, Santiago, Chile.

P. Carlos Bobillier, Director.

C.-F.  $33^{\circ} 27' S$ ;  $70^{\circ} 11' W$ . 581 m. Basalt.

I. Bosch-Omori, NNE and NNW; Wiechert, ESE, ENE and Z; Stiattessi, N and E.

S. University of Chile.

Pu. Bulletin of the Seismological Service of Chile, Annual.

**266. Sapporo.**

A. Sapporo Meteorological Station, Sapporo, Hokkaido, Japan.

P. Chozaburo Kazinuma, in charge.

C.-F.  $43^{\circ} 04' N$ ;  $141^{\circ} 21' E$ . 15 m.

I. Wiechert, N, E and Z, 1924.

S. Central Meteorological Observatory, Tokyo.

Pu.

**267. Sarajevo.**

A. Seismologique Station, Observatoire Meteorologique, Sarajevo, Jugoslavia.



*P.* M. Jovan Popovic, Director.

*C.-F.*  $43^{\circ} 52' N$ ;  $17^{\circ} 49' E$ . 630 m. Marnes tertiaries.

*I.* Wiechert, N and E.

*S.*

*Pu.* Annuaire Seismique, Seismological Institute, University of Belgrad.

Saskatchewan, University of. *See* Saskatoon, No. 269.

**268. Sasebo.**

*A.* Sasebo Meteorological Observatory, Sasebo, Kyusyu District, Japan.

*P.*

*C.-F.*  $33^{\circ} 10' N$ ;  $129^{\circ} 43' E$ .

*I.* Omori portable, horizontal.

*S.*

*Pu.*

**269. Saskatoon.**

*A.* University of Saskatchewan, Saskatoon, Saskatchewan, Canada.

*P.* E. L. Harrington, Professor of Physics, in charge.

*C.-F.*  $52^{\circ} 08' N$ ;  $106^{\circ} 30' W$ . 515 m. Clay and sand.

*I.* Mainka, N and E, 1915.

*S.* University of Saskatchewan and Dominion Observatory, Ottawa, Canada.

*Pu.* Monthly Bulletin, Dominion Observatory, Ottawa, Canada.

**270. Scoresby-Sund.**

*A.* Geodetic Institute, Copenhagen, Denmark.

*P.*

*C.-F.*  $70^{\circ} 29' N$ ;  $21^{\circ} 57' W$ . 69 m. Granite.

*I.* Galitzin, N, E and Z, 1928.

*S.* Geodetic Institute, Copenhagen, Denmark; Carlsberg Foundation.

*Pu.* Bulletin, Published by Geodetic Institute, Copenhagen.

**271. Sebastopol.**

*A.* Institut Seismologique de l'Academie des Sciences de l'U. S. S. R., Leningrad, U. S. S. R.

*P.* V. Sneginski, Official in charge.

*C.-F.*  $44^{\circ} 37' N$ ;  $33^{\circ} 32' E$ . 2 m. Limestone.

*I.* Nikiforoff, N and E, 1928.

*S.* Academy of Sciences, Leningrad.

*Pu.* Bulletin, Academy of Sciences, Leningrad.

**272. Sendai.**

A. Physical Institute, Tohoku Imperial University, Sendai, Japan.

P. Saemontaro Nakamura, Director.

C.-F.  $38^{\circ} 15' N$ ;  $140^{\circ} 52' E$ . 88 m. Tertiary.

I. Imamura; Omori micro-seismometer; Omori seismometer; Omori vertical component seismometer; Wiechert, Z; Mainka; Omori tromometer; Nakamura seismometer; 1913.

S. Tohoku Imperial University.

Pu. No publications at present.

**273. Shimonoseki.**

A. Shimonoseki Meteorological Observatory, Shimonoseki, Japan.

P.

C.-F.  $33^{\circ} 57' N$ ;  $130^{\circ} 56' E$ .

I. C. M. O. horizontal.

S.

Pu.

**274. Shionomisaki.**

A. Shionomisaki Meteorological Observatory, Shionomisaki, Wakayama, Japan.

P. Zyunzi Terazima, in charge.

C.-F.  $33^{\circ} 27' N$ ;  $135^{\circ} 46' E$ . 74 m.

I. Wiechert, N, E and Z; Omori strong motion, N, E and Z, 1911.

S. Central Meteorological Observatory, Tokyo.

Pu. Bulletin of the C. M. O.

**275. Sibenik.**

A. Station Seismologique, Sibenik, Jugoslavia.

P. M. M. Angelli, Director.

C.-F.  $43^{\circ} 03' N$ ;  $15^{\circ} 54' E$ . 4 m. Limestone.

I. Conrad, E, 1926.

S. Institut Seismologique de Belgrad.

Pu. Annuaire Seismique, Seismological Institute, University of Belgrad.

**276. Sikka.**

A. Ootomari Meteorological Observatory, Karafuto, Japan.

P.

C.-F.  $49^{\circ} 14' N$ ;  $143^{\circ} 07' E$ . 2 m. Tertiary.

I. Imamura, N and E.

S. Karafuto prefecture.

Pu. Seismological Bulletin of the Ootomari Meteorological Observatory.

**277. Simferopol.**

A. Institut Seismologique de l'Academie des Sciences de l'U. S. S. R., Leningrad, U. S. S. R.

P. I. Tikhanovski, Official in charge.

C.-F.  $44^{\circ} 57' N$ ;  $34^{\circ} 07' E$ . 277 m. Limestone.

I. Nikiforoff, N and E, 1928.

S. Academy of Sciences, Leningrad, Executive Committee of the Crimea.

Pu. Bulletin, Academy of Sciences, Leningrad.

**278. Simizu.**

A. Simizu Meteorological Observatory, Simizu, Sikoku District, Japan.

P.

C.-F.  $32^{\circ} 47' N$ ;  $132^{\circ} 58' E$ .

I. Wiechert, N, E and Z.

S.

Pu.

**279. Sitka.**

A. U. S. Magnetic Observatory, Sitka, Alaska, U. S. A.

P. Franklin P. Ulrich, Observer in charge.

C.-F.  $57^{\circ} 03' N$ ;  $135^{\circ} 20' W$ . 15 m. Slate.

I. Bosch-Omori, N and E, 1904, discontinued; Wood-Anderson, E, temporary; Wenner, N and E, to be installed in 1930.

S. U. S. Coast and Geodetic Survey, Washington, D. C., U. S. A.

Pu. Monthly Report, Earthquakes of the United States, Annual.

**280. Sofia.**

A. Institut Météorologique Central de Bulgarie, rue Regentska, Sofia, Bulgarie.

P. K. T. Kiroff, Official in charge.

C.-F.  $42^{\circ} 42' N$ ;  $23^{\circ} 30' E$ . 350 m. Alluvium on sand.

I. Bosch-Omori, N and E and NE, 1905.

S.

Pu. Bulletin Seismographique, 1910-1911; discontinued.

South Yarra. See Melbourne, No. 180.

Specola Metero-Sismica. See Foggia, No. 76.

**281. Spokane, Washington.**

A. Seismograph Station, Gonzaga University, Spokane, Washington, U. S. A.

P. A. M. Jung, Seismologic Observer in charge.

C.-F.  $47^{\circ} 40' N$ ;  $117^{\circ} 25' W$ . 584 m. Gravel and sand.

*I.* Wiechert, N and E, 1909.

*S.* Gonzaga University.

*Pu.* Yearly Bulletin.

Spring Hill College. *See* Mobile, Ala., No. 194.

Stanford University. *See* Palo Alto, No. 228.

## 282. Stockton.

*A.* College of the Pacific, Biologic Sciences, Stockton, California,  
U. S. A. (Instruments not yet installed, January, 1928.)

## 283. Stonyhurst.

*A.* Stonyhurst College Observatory, North Blackburn, England.

*P.* E. D. O'Connor, Director, J. P. Rowland, Seismologist.

*C.-F.*  $53^{\circ} 51' N$ ;  $2^{\circ} 28' W$ . 116 m. Clay over limestone.

*I.* Milne, 1909, discontinued, 1924; Milne-Shaw, E; 1928.

*S.* Stonyhurst College.

*Pu.* Monthly Bulletin.

## 284. Strasbourg.

*A.* Institut de Physique du Globe, 38, boulevard d'Anvers, Strasbourg, France.

*P.* E. Rothé, Director; Joseph Lacoste, Assistant Director;  
Charles Bois, Assistant.

*C.-F.*  $48^{\circ} 35' N$ ;  $7^{\circ} 46' E$ . 135 m. Gravel.

*I.* Galitzin, N, E and Z; Milne-Shaw, N and E; Wiechert, N,  
E and Z; 19 ton apparatus, N and E; service began, 1899.

*S.* University of Strasbourg.

*Pu.* Monthly Bulletin, Central Bureau; Monthly Bulletin, University of Strasbourg; Monthly Bulletin, International Geodetic and Geophysical Union; Annual Publication of the Institut de Physique du Globe.

## 285. Stuttgart.

*A.* Erdbebenwarte, Hohenheim, Stuttgart, Deutschland.

*P.* A. Wigand, Director.

*C.-F.*  $48^{\circ} 46' N$ ;  $9^{\circ} 12' E$ . 375 m. Marls.

*I.* Galitzin, N, E and Z; 80 kg. Pendulum, N and E; magnetic damping; 1930.

*S.* Meteorologisch-Geophysikalischen Ableitung des Württ. Statistischen Landesamts, Stuttgart.

*Pu.* Seismological Bulletin, Hohenheim, Stuttgart and Ravensburg, semi-annual.

**286. Subiaco.**

*A.* Osservatorio Simbruino, Subiaco, Roma, Italia.

*P.* Ugo Cipolletti in charge.

*C.-F.*  $41^{\circ} 54' N$ ;  $13^{\circ} 00' E$ . 511 m.

*I.* Astatic pendulum, N and E, 1915.

*S.* Regio Ufficio Centrale di Meteorologia e Geofisica di Roma.

*Pu.* Reports to above.

**287. Sucre.**

*A.* Observatorio del Colegio del Sagardo Corazon, Sucre, Bolivia.

*P.* Francisco Cerro, Director.

*C.-F.*  $19^{\circ} 03' S$ ;  $65^{\circ} 16' W$ . 2850 m. Red clay.

*I.* Bifilar, 3000 kg., N; vertical component, 1340 kg.; 1926.

*S.* Colegio del Sagardo; Jesuit Association.

*Pu.* Seismological Bulletin.

**288. Sumoto.**

*A.* Sumoto Branch Office, Kobe Meteorological Observatory, Sumoto Awaji, Japan.

*P.* Kwanji Suda, Official in charge.

*C.-F.*  $34^{\circ} 21' N$ ;  $134^{\circ} 53' E$ . 109 m. Cretaceous.

*I.* Wiechert, N, E and Z; Omori seismograph, N and E; C. M. O. type; strong motion seismometer.

*S.* Kobe Meteorological Observatory.

*Pu.* Seismological Bulletin of the Imperial Marine Observatory and Kobe Meteorological Observatory.

**289. Suttu.**

*A.* Suttu Meteorological Observatory, Suttu, Hokkaido District, Japan.

*P.*

*C.-F.*  $42^{\circ} 48' N$ ;  $140^{\circ} 13' E$ .

*I.* Omori portable, horizontal.

*S.*

*Pu.*

**290. Suva, Fiji.**

*A.*

*P.*

*C.-F.*  $18^{\circ} 07' S$ ;  $178^{\circ} 23' E$ .

*I.* Milne, twin-boom.

*S.*

*Pu.* Reports to Wellington, N. Z.

**291. Sverdlovsk (Formerly Ekaterinburg).**

*A.* Seismologic Station, Geophysical Observatory, Sverdlovsk, Uralian Province, U. S. S. R.

*P.* Z. Weiss-Xenofontova, Official in charge.

*C.-F.*  $58^{\circ} 50' N$ ;  $60^{\circ} 38' E$ . 275 m. Serpentine.

*I.* Galitzin, N, E and Z, 1913.

*S.* Academy of Sciences, Leningrad.

*Pu.* Monthly Bulletin, and Bulletin Academy of Sciences, Leningrad.

**292. Swarthmore.**

*A.* Sproul Observatory, Swarthmore, Pennsylvania, U. S. A.

*P.* John A. Miller, Director.

*C.-F.*  $39^{\circ} 54' N$ ;  $75^{\circ} 21' W$ . 59 m. Clay.

*I.* Milne, E, 1902.

*S.* Swarthmore College; Sproul Observatory.

*Pu.* No.

**293. Sydney.**

*A.* Government Observatory, Sydney, New South Wales, Australia.

*P.* James Nangle, Director; W. C. Graham, Observer.

*C.-F.*  $33^{\circ} 52' S$ ;  $151^{\circ} 12' E$ . 43 m. Hawksbury sandstone.

*I.* Milne, E, 1906.

*S.* Sydney Observatory.

*Pu.* Monthly reports to Oxford; International Seismological Summary, Oxford, England.

**294. Tachkent.**

*A.* Seismologic Station, Tachkent, Turkestan, U. S. S. R.

*P.* G. Popov, Official in charge.

*C.-F.*  $41^{\circ} 20' N$ ;  $69^{\circ} 18' E$ . Loess.

*I.* Galitzin, N, E and Z, 1912.

*S.* Academy of Sciences, U. S. S. R., Leningrad.

*Pu.* Monthly Bulletin, and Bulletin Academy of Sciences, U. S. S. R., Leningrad.

**295. Tacubaya.**

*A.* Instituto Geológico, 6a Cipres, núm. 176, Mexico, D. F.

*P.* Manuel Munoz Lumbier, Chief Seismologist; Francisco Patiño Ordáz, First Seismologist; Ulisea Ocampo Rubio, Second Seismologist.

*C.-F.*  $19^{\circ} 24' N$ ;  $99^{\circ} 12' W$ . 2297 m. Volcanic series.

*I.* Service began 1910; Wiechert, 17,000 kg, N and E; Wiechert, 1200 kg, N and E; Wiechert, 200 kg, N and E; Wiechert, 125 kg, N and E; Wiechert, 1300 kg, Z; Wiechert, 80 kg, Z; Bosch-Omori, N and E; Bosch-Omori. 0.2 kg, N and E; Wiechert-Mintrop tromometer; Schmidt trifilar gravimeter.

*S.* Servicio Sismológico Nacional, dependiente del Instituto Geológico de Mexico.

*Pu.* Catalog de los Temblores, Annual.

**296. Tadotu.**

*A.* Tadotu Meteorological Station, Tadotu, Kagawa Ken, Japan.

*P.* Y. Katsuno, Director; S. Amino, Assistant.

*C.-F.*  $34^{\circ} 17' N$ ;  $133^{\circ} 36' E$ . 4 m. Alluvium.

*I.* Omori, 1892; Omori portable, E; Strong motion, N and E, 1927; Milne, N, E and Z.

*S.* Kagawa province.

*Pu.* Bulletin of the local office.

**297. Taihoku.**

*A.* Meteorological Observatory, Taihoku, Taiwan, Japan.

*P.* S. Teramoto, Director; F. Fujii, in charge.

*C.-F.*  $25^{\circ} 02' N$ ;  $121^{\circ} 31' E$ . 8 m. Alluvium.

*I.* Gray-Milne, N, E and Z; Omori tromometer, N and E; Wiechert, N, E and Z; 1898.

*S.* Government of Formosa.

*Pu.* Monthly Bulletin.

**298. Taiku.**

*A.* Taiku Meteorological Observatory, Taiku, Korea, Japan.

*P.*

*C.-F.*  $35^{\circ} 52' N$ ;  $128^{\circ} 36' E$ .

*I.* Wiechert, N, E and Z.

*S.*

*Pu.*

**298.1. Tainan.**

*A.* Meteorological Observatory, Taihoku, Taiwan, Japan.

*P.* J. Watanabe, Director.

*C.-F.*  $23^{\circ} 00' N$ ;  $120^{\circ} 13' E$ . 13 m. Alluvial.

*I.* Gray-Milne, N, E, Z; Omori tromometer, E, 1900.

*S.* Government of Formosa.

*Pu.* No.

**299. Taitô.**

*A.* Meteorological Observatory, Taihoku, Taiwan, Japan.

*P.* H. Otuka, Director in charge.

*C.-F.*  $22^{\circ} 45' N$ ;  $121^{\circ} 09' E$ . 9 m. Alluvium.

*I.* Omori tromometer, E, 1902; Gray-Milne, 1909.

*S.* Government of Formosa.

*Pu.* No.

**300. Taityû.**

*A.* Meteorological Observatory, Taihoku, Taiwan, Japan.

*P.* I. Ititi, Director in charge.

*C.-F.*  $24^{\circ} 09' N$ ;  $120^{\circ} 41' E$ . 77 m. Alluvium.

*I.* Omori tromometer, E, 1902; Gray-Milne, N, E and Z, 1909.

*S.* Government of Taiwan.

*Pu.* No.

**301. Takata.**

*A.* Takata Meteorological Observatory, Takata, Japan.

*P.*

*C.-F.*  $37^{\circ} 06' N$ ;  $138^{\circ} 15' E$ .

*I.* Nakamura, horizontal.

*S.*

*Pu.*

**302. Takayama.**

*A.* Takayama Meteorological Observatory, Takayama, Japan.

*P.*

*C.-F.*  $36^{\circ} 09' N$ ;  $137^{\circ} 15' E$ . 560 m. Soft ground.

*I.* Omori tromometer, N and E, 1915.

*S.*

*Pu.*

**303. Tananarive.**

*A.* The Director, Observatoire de Tananarive, Tananarive, Madagascar.

*P.* Charles Poisson, in charge.

*C.-F.*  $18^{\circ} 55' S$ ;  $47^{\circ} 33' E$ . 1375 m. Red clay and gneiss.

*I.* Cecchi, 1898; Mainka, N and E, 1927.

*S.* Roman Catholic Mission at Tananarive (Jesuit).

*Pu.* Monthly Bulletin.

**304. Tarente.**

*A.* Osservatoire Meteorologique et Geophysique de Tarente, Italy.

*P.* Louis Ferrajolo, Director.

*C.-F.*  $40^{\circ} 28' N$ ;  $17^{\circ} 15' E$ . 22 m. Gravel.



*I.* Wiechert, SW and SE; Vicentini, N, E and Z; Cartuja.

*S.* Provincial and municipal governments.

*Pu.* Quarterly report.

### 304.1 Taunus.

*A.* Taunus Observatorium, Königstein, Taunus, Deutschland.

*P.* F. Linke, Director.

*C.-F.*  $50^{\circ} 13' N$ ;  $8^{\circ} 27' E$ . 873 m. Quartzite.

*I.* Galitzin, N; Mainka, N and E; Wiechert, Z, 1912.

*S.* Taunus Observatorium, University of Frankfurt-am-Main.

*Pu.* Monthly Bulletin.

### 305. Theodosia.

*A.* Hydro-Meteorological Office, Theodosia, the Crimea, U. S. S. R.

*P.* S. V. Szymanowski, Official in charge.

*C.-F.*  $45^{\circ} 01' N$ ;  $35^{\circ} 23' E$ . 59 m. Marly clay.

*I.* Nikiforoff, NNW and NNE, 1927.

*S.* Central Office of the Marine Transport; Academy of Sciences, U. S. S. R., Leningrad.

*Pu.* Bulletin, Academy of Sciences, U. S. S. R., Leningrad.

Theosophical University. *See* Point Loma, No. 238.

### 306. Tiflis.

*A.* Geophysical Observatory of Georgia, Tiflis, Georgia, Caucasus, U. S. S. R.

*P.* E. J. Buss, Official in charge; V. M. Ghighineyshvili, Physicist.

*C.-F.*  $41^{\circ} 43' N$ ;  $44^{\circ} 48' E$ . 401 m. Alluvial conglomerate.

*I.* Galitzin, N, E and Z. Galitzin mechanical registration, N and E; Cancani pendulum, 1900.

*S.* Geophysical Observatory of Georgia.

*Pu.* Monthly Bulletin.

### 307. Tinemaha.

*A.* Seismological Laboratory, 220 North San Rafael Avenue, Pasadena, California, U. S. A.

*P.* Harry O. Wood, Research Associate in Seismology, Carnegie Institution of Washington.

*C.-F.*  $37^{\circ} 06' N$ ;  $118^{\circ} 16' W$ . 1180 m. Basalt. Depth to water unknown, but probably great.

*I.* Wood Anderson, N and E, 1929.

*S.* Carnegie Institution of Washington and Bureau of Water Works and Supply, City of Los Angeles, Calif.

*Pu.* No routine publication; *see* Pasadena.

**308. Titibu.**

A. Titibu Seismological Station, Saitama, Japan. (Dendrological Laboratory of the Tokyo Imperial University.)

P.

C.-F.  $35^{\circ} 59' N$ ;  $139^{\circ} 05' E$ .

I. No. 1, N and E.

S. Tokyo Imperial University.

Pu. See Tokyo.

**309. Togane.**

A. Togane Seismological Station, Togani-mati, Tiba, Japan.

P.

C.-F.  $35^{\circ} 34' N$ ;  $140^{\circ} 22' E$ .

I. No. 1, N and E.

S. Tokyo Imperial University.

Pu. See Tokyo.

Tohoku Imperial University. See Sendai, No. 272.

**310. Tokushima.**

A. Tokushima Meteorological Observatory, Tokushima, Japan.

P. G. Jimba, Director.

C.-F.  $34^{\circ} 04' N$ ;  $134^{\circ} 33' E$ . 3 m. Soft ground.

I. Imamura, N and E, 1913; Omori portable, horizontal.

S.

Pu.

**311. Tokyo.**

A. Central Meteorological Observatory, Chuo-Kishodai, Tokyo, Japan.

P. T. Okada, Director; S. I. Kunitomi, in charge.

C.-F.  $35^{\circ} 41' N$ ;  $139^{\circ} 45' E$ . 21 m. Diluvium.

I. Galitzin, N, E and Z; Mainka, N and E; Wiechert, N, E and Z; Omori, N and E; C. M. O. type, N, E and Z; C. M. O. portable, N and E, 1875.

S. Imperial Japanese Government, Department of Education.

Pu. Seismological Bulletin of the C. M. O.; Annual in English.

**312. Tokyo.**

A. Seismological Institute, Tokyo Imperial University, Tokyo, Japan.

P. Akitune Imamura, Director.

C.-F.  $35^{\circ} 43' N$ ;  $139^{\circ} 46' E$ . 19 m. Diluvium, clay.

I. Strong motion, N, E and Z, 5 sets; Wiechert, N, E and Z; Accelerometer; Horizontal Seismometers as follows: No. 4, N and E; No. 5, N and E; No. 6, E; No. 7, N; No. 8, N; No. 13, E;

No. 14, E; No. 15, N; No. 16, E; No. 17, N and E; No. 19, Z; No. 20, N and E; 1880.

*S.* Tokyo Imperial University.

*Pu.* (a) Routine measurements not published.

(b) Bulletin of the Earthquake Research Institute.

(c) Journal of the Faculty of Science.

(d) Japanese Journal of Astronomy and Geophysics.

(e) Proceedings of the Imperial Academy.

### 313. Toledo.

*A.* Seismológica, Toledo, España.

*P.* Alfonso Rey Pastor, Director.

*C.-F.*  $39^{\circ} 52' N$ ;  $4^{\circ} 02' W$ . 519 m. Gneiss.

*I.* Wiechert, NE and NW; Wiechert, Z, 1909.

*S.* Instituto Geográfico y Catastral, Madrid.

*Pu.* Monthly Bulletin, Instituto Geográfico y Catastral, Madrid.

### 314. Toronto.

*A.* The Director of the Meteorological Service, Toronto, Canada.

*P.* Frederick Stupart, Director; J. Young, Seismologist; W. G. Carroll, Assistant.

*C.-F.*  $43^{\circ} 40' N$ ;  $79^{\circ} 24' W$ . 111 m. Sand and clay.

*I.* Milne-Shaw, N and E, 1923, replacing Milne, E, in operation since 1897.

*S.* Dominion Government.

*Pu.* Monthly Bulletin and Monthly Meteorological Report.

Tortosa. *See* Ebro, No. 69.

### 315. Toyooka.

*A.* Branch Station, Kobe Meteorological Observatory, Kobe, Japan.

*P.*

*C.-F.*  $35^{\circ} 32' N$ ;  $134^{\circ} 49' E$ . 32 m. Diluvium.

*I.* Wiechert, N, E and Z.

*S.* Kobe Meteorological Observatory, Kobe, Japan.

*Pu.* Seismological Bulletin, Imperial Marine Observatory and Kobe Meteorological Observatory.

### 316. Travnik.

*A.* Gymnasium, Travnik, Jugoslavia.

*P.* P. Gartler, Director.

*C.-F.*

*I.* Conrad, E.

*S.*

*Pu.*

**317. Trento.**

*A.* Osservatorio Meteorologico-Geodinamico "Proviero," Trento, Cosenza, Italia.

*P.* D. Antonio Proviero, Director.

*C.-F.*  $39^{\circ} 17' N$ ;  $16^{\circ} 19' E$ . 586 m. Sedimentary rocks.

*I.* Agamennone Seismometrograph, N, E and Z; vertical micro-seismometrograph, 1915.

*S.* Royal and provincial governments.

*Pu.* Bulletin of the R. Ufficio Centrale di meteorologia e geodinamico di Roma.

**318. Treviso.**

*A.* Osservatorio del Seminario, Treviso, Italy.

*P.* Giacomo Schiavon, Director; Giulio Stocco.

*C.-F.*  $45^{\circ} 40' N$ ;  $12^{\circ} 15' E$ . 14 m. Alluvium. 5 m to water.

*I.* Vicentini, N, E and Z; Alfani, N, E and Z, 1914.

*S.* Roman Catholic Episcopal Seminary of Treviso.

*Pu.* Reports to R. Ufficio Centrale di Meteorologia e Geofisica, Rome, and Strasbourg, France.

**319. Tsingtao.**

*A.* Observatoire de Tsingtao, Tsingtao, Changtung, China.

*P.* P. J. Tsiang, Director; T. I. Sie, Assistant.

*C.-F.*  $36^{\circ} 04' N$ ;  $120^{\circ} 19' E$ . 70 m. Igneous rock.

*I.* Wiechert, N and E, 1926.

*S.* Observatoire de Tsingtao.

*Pu.*

**320. Tsitsishima.**

*A.* Tsitsishima Meteorological Observatory, Tsitsishima, Japan.

*P.*

*C.-F.*  $27^{\circ} 05' N$ ;  $142^{\circ} 11' E$ .

*I.* Wiechert, N, E and Z.

*S.*

*Pu.*

**321. Tsu.**

*A.* Tsu Meteorological Station, Tsu, Mie, Japan.

*P.* S. Yasaki, Director.

*C.-F.*  $34^{\circ} 44' N$ ;  $136^{\circ} 31' E$ . 3 m. Sand. 4 m to water.

*I.* Milne, N, E and Z; C. M. O. Type, N and E, 1910.

*S.* Mie prefecture.

*Pu.* Reports to C. M. O.

**322. Tsukuba-san.**

A. Tsukuba-san Meteorological Observatory, Tsukuba-san Ibaraki-ken, Japan.

P. Z. Sato, Director.

C.-F.  $36^{\circ} 13' N$ ;  $140^{\circ} 06' E$ . 870 meters. Diorite.

I. Wiechert, N, E and Z.

S.

Pu.

Sub-station.

C.-F.  $36^{\circ} 12' N$ ;  $140^{\circ} 06' E$ . 240 m. Decomposed Diorite.

I. Omori tromometer, E, 1902.

**323. Tukuba.**

A. Tukuba Seismological Station, Hitati, Japan.

P.

C.-F.  $36^{\circ} 09' N$ ;  $140^{\circ} 09' E$ . 290 m. Granite.

I. Gray-Ewing, N, E and Z; No. 2, N.

S. Tokyo Imperial University.

Pu. See Tokyo.

**324. Tucson.**

A. Tucson Magnetic Observatory, R. F. D. No. 2, Tucson, Arizona, U. S. A.

P. A. K. Ludy, Observer in charge; John Hershberger, Assistant.

C.-F.  $32^{\circ} 15' N$ ;  $110^{\circ} 50' W$ . 770 m. Sand and gravel.

I. Bosch-Omori, N and E, 1909; Discontinued in 1925; Wood-Anderson, N and E, long period, 1925.

S. U. S. Coast and Geodetic Survey, Washington, D. C.

Pu. Same as Sitka, No. 279.

**325. Tyôsi.**

A. Tyôsi Meteorological Observatory, Tyôsi, Japan.

P.

C.-F.  $35^{\circ} 44' N$ ;  $140^{\circ} 51' E$ .

I. Wiechert, N, E and Z.

S.

Pu.

**326. Uccle.**

A. Observatoire Royal, Uccle (Bruxelles), Belgique.

P. P. Strosbant, Director. O. Somville, Chief of Seismologic Service; Ch. Charlier, Assistant Seismologist.

C.-F.  $50^{\circ} 48' N$ ;  $4^{\circ} 22' E$ . 100 m. Limestone.

*I.* Wiechert, N, E and Z; Galitzin, N and E; 1924.

*S.* Supported by the Government.

*Pu.* Seismological Bulletin.

Union Observatory. *See* Johannesburg, No. 122.

U. S. Coast and Geodetic Survey. *See* Honolulu, No. 109.

U. S. Magnetic Observatory. *See* Sitka, No. 279.

U. S. Weather Bureau. *See* Chicago, No. 51.

**327. Unzen-dake.**

*A.* Unzen-dake Meteorological Observatory, Unzen-dake, Kyusyu District, Japan.

*P.*

*C.-F.*  $32^{\circ} 44' N$ ;  $130^{\circ} 17' E$ .

*I.* Omori Tromometer, horizontal; Wiechert, Z.

*S.*

*Pu.*

Upper Air Observatory. *See* Agra, No. 5.

**328. Upsala.**

*A.* Meteorological Observatory, Upsala, Sweden.

*P.* Philip Akerblom, Director.

*C.-F.*  $59^{\circ} 51' N$ ;  $17^{\circ} 38' E$ . 14 m. Crystalline rock.

*I.* Wiechert, N and E, 1904.

*S.* University of Upsala.

*Pu.* Series: Seismological Observations made at the Meteorological Observatory of Upsala.

**329. Utsunomiya.**

*A.* Utsunomiya Meteorological Observatory, Utsunomiya, Japan.

*P.*

*C.-F.*  $36^{\circ} 34' N$ ;  $139^{\circ} 53' E$ .

*I.* Omori portable, horizontal.

*S.*

*Pu.*

**330. Uwazima.**

*A.* Uwazima Meteorological Observatory, Uwazima, Sikoku District, Japan.

*P.*

*C.-F.*  $33^{\circ} 14' N$ ;  $132^{\circ} 33' E$ .

*I.* Nakamura, horizontal.

*S.*

*Pu.*

**331. Uwekahuna.**

*A.* Hawaiian Volcano Observatory, Volcano House, Hawaii, U. S. A.

*P.* T. A. Jaggar, Volcanologist in charge.

*C.-F.* 3 km. west of Hawaiian Volcano Observatory, Volcano House, Hawaii.

*I.* Imamura, N, E and Z, 1930.

*S.* U. S. Geological Survey and Hawaiian Volcano Research Association.

*Pu.* Weekly Letter and Monthly Bulletin, Hawaiian Volcano Observatory.

**332. Uzhorod.**

*A.* Observatoire sismologique, Realgimnasium Uzhorod, Ungvar, Czechslovakia.

*P.* Papp Ferenc, in charge.

*C.-F.*  $48^{\circ} 38' N$ ;  $22^{\circ} 18' E$ . 137 m. Concrete to 18 m.

*I.* Bosch-Omori, N and E, 1911.

*S.* Government institution.

*Pu.* Seismological Bulletin; Institut Geophysique National Tschecoslovaque.

**333. Valle di Pompei.**

*A.* Osservatorio, Valle di Pompei, Napoli, Italia.

*P.* Giovanni Alfano, Director.

*C.-F.*  $40^{\circ} 45' N$ ;  $14^{\circ} 30' E$ . 12 m. Tuffs.

*I.* Omori-Alfani, N and E; Navarro-Neumann, E; Marcelli, N; Grablovitz vasca, N and E; Alfani Ortosismografo, Z; began 1907.

*S.*

*Pu.* Bulletin, three times a year.

Vassar College. *See* Poughkeepsie, No. 242.

**334. Venice.**

*A.* Osservatorio Geofisico del Seminario Patriarcale di Venezia, Venezia, Italia.

*P.* Francisco Saverio Zanon, Director.

*C.-F.*  $45^{\circ} 26' N$ ;  $12^{\circ} 20' E$ . 1 m. Argillaceous rock.

*I.* Vicentini, N, E and Z; Agamennone, N and E; Bertelli Tromometer; Agamennone Seismoscope; began 1904.

*S.* Osservatorio Geofisico del Seminario Patriarcale.

*Pu.* Monthly Bulletin.

**335. Vera Cruz.**

A. Estación Sismológica del Colegio Preparatorio, Vera Cruz, Mexico.

P. Ernesto Dominguez, in charge.

C.-F.  $19^{\circ} 12' N$ ;  $96^{\circ} 08' W$ . 3 m. Basalt.

I. Wiechert, N, E and Z, 1921.

S. Instituto de Geologia, 6a del Cipres, núm. 176, Mexico, D. F.

Pu. Catalog de los Temblores, Annual.

Verny. See Alma-Ato, No. 12.

**336. Victoria.**

A. Director, Dominion Meteorological Observatory, Gonzales Heights, Victoria, B. C., Canada.

P. F. Napier Denison, Director.

C.-F.  $48^{\circ} 25' N$ ;  $123^{\circ} 19' W$ . 68 m. Rock.

I. Milne, N and E, 1898; Wiechert, Z; Milne-Shaw, N and E, 1922.

S. Dominion Meteorological Service, Toronto, Canada. Science Service, Washington, D. C., telegraphic reports.

Pu.

**337. Vienna (Wien).**

A. Erdbebenwarte, Zentralanstalt für Meteorologie und Geodynamik, Wien, XIX/1, Hohe Warte 38, Oesterreich.

P. F. M. Exner, Director. Victor Conatd, in charge of station.

C.-F.  $48^{\circ} 15' N$ ;  $16^{\circ} 22' E$ . 198 m. Loess.

I. Wiechert, N, E and Z; Conrad, NE, 1905.

S. Government station.

Pu. Seismological Bulletin.

Virginia, University of. See Charlottesville, No. 47.

**338. Vladivostok.**

A. Academy of Sciences, U. S. S. R., Leningrad.

P. A. Ulanov, Official in charge.

C.-F.  $43^{\circ} 07' N$ ;  $131^{\circ} 57' E$ . Sandstone.

I. Galitzin, N, E and Z.

S. Academy of Sciences, U. S. S. R., Leningrad.

Pu. Seismological Bulletin, U. S. S. R., Leningrad

**339. Volcano House.**

A. Hawaiian Volcano Observatory, Volcano House, P. O., Hawaii, U. S. A.

P. T. A. Jaggard, Volcanologist, Director.



*C.-F.*  $19^{\circ} 26' N$ ;  $155^{\circ} 16' W$ . 1213 m. Basalt.

*I.* Bosch-Omori, N and E, 1912.

*S.* U. S. Geological Survey; Hawaiian Volcano Research Association.

*Pu.* Weekly Letter; Monthly Bulletin.

**340. Wakayama.**

*A.* Wakayama Meteorological Observatory, Wakayama, Japan.

*P.*

*C.-F.*  $34^{\circ} 14' N$ ;  $135^{\circ} 10' E$ .

*I.* C. M. O. type.

*S.*

*Pu.*

Washington, D. C. *See* Georgetown, No. 81.

**341. Wellington.**

*A.* Dominion Observatory, Kelburn, Wellington, New Zealand.

*P.* Charles Edward Adams, Dominion Astronomer and Seismologist.

*C.-F.*  $41^{\circ} 17' S$ ;  $174^{\circ} 46' E$ . 127 m. Graywacke and argillite.

*I.* Milne, E, 1898; Milne-Shaw, N and E, 1924.

*S.* New Zealand Government.

*Pu.* Earthquake Reports, Immediate; Quarterly Report for New Zealand and Fiji.

Wetlevreden. *See* Batavia, No. 28.

**342. Worcester.**

*A.* Seismologic Station, Holy Cross College, Worcester, Massachusetts, U. S. A.

*P.* T. H. Quigley, in charge.

*C.-F.*  $42^{\circ} 16' N$ ;  $71^{\circ} 48' W$ . 203 m.

*I.* Wiechert, N and E; not in operation.

*S.* College of the Holy Cross.

*Pu.* No.

**343. Yagi.**

*A.* Yagi Meteorological Observatory, Yagi Cho, Nara, Japan.

*P.* T. Oyama, Director.

*C.-F.*  $34^{\circ} 31' N$ ;  $135^{\circ} 48' E$ . 63 m. Alluvium.

*I.* Horizontal Seismograph, E, 1917.

*S.* Nara prefecture.

*Pu.* No.

Yale Seismograph Station. *See* New Haven, No. 210.

**344. Yalta.**

A. Seismologic Station, Proletarskaya St., 10, Yalta, Crimea,  
U. S. S. R.

P. A. Polumb, Official in charge.

C.-F.  $44^{\circ} 30' N$ ;  $34^{\circ} 10' E$ . 93 m. Clayey schists.

I. Nikiforoff, N and E, 1928.

S. Executive Committee of Yalta and Academy of Sciences,  
U. S. S. R., Leningrad.

Pu. Seismological Bulletin, U. S. S. R., Leningrad.

**345. Yamagata.**

A. Yamagata Meteorological Observatory, Yamagata, Japan.

P. M. Morita, Director.

C.-F.  $38^{\circ} 15' N$ ;  $140^{\circ} 21' E$ . 151 m. Soft ground.

I. Imamura, N and E, 1913; Nakamura, horizontal.

S.

Pu.

**346. Yokohama.**

A. Yokohama Meteorological Observatory, Yokohama. Japan.

P.

C.-F.  $35^{\circ} 26' N$ ;  $139^{\circ} 39' E$ .

I. Wiechert, N, E and Z.

S.

Pu.

**347. Yokosuka.**

A. Yokosuka Meteorological Observatory, Yokosuka, Japan.

P.

C.-F.  $35^{\circ} 17' N$ ;  $139^{\circ} 40' E$ .

I. Omori portable, horizontal.

S.

Pu.

**348. Zagreb.**

A. Geofizicki institut, Zagreb IV-Gric. 3, Zagreb, Jugoslavia.

P. Stjepan Skreb, Director.

C.-F.  $45^{\circ} 49' N$ ;  $15^{\circ} 59' E$ . 155 m. Clay.

I. Wiechert, 1000 kg., NE and NW; Wiechert, 80 kg., NE and  
NW, 1883.

S. Geophysical Institute, Bureau of the Government.

Pu. Monthly Bulletin.

**349. Zi-ka-wei.**

*A.* de l'Observatoire de Zi-ka-wei, près Chang-hai, Chine.

*P.* E. Gherzi, in charge; Zi Ling-fong, Assistant.

*C.-F.*  $31^{\circ} 12' N$ ;  $121^{\circ} 26' E$ . 7 m. Alluvium.

*I.* Omori, N and E, 1903; Wiechert, N and E, 1909; Wiechert, Z, 1923; Galitzin, Z., 1913.

*S.* Jesuit Mission of Nankin.

*Pu.* Seismological Bulletin; Notes on Seismology, Annual.

**350. Zürich.**

*A.* Schweizerischer Erdbebendienst, Meteorologische Centralanstalt, Zürich, Schweiz.

*P.* Julius Maurer, Director; Ernest Wanner, in charge of seismology.

*C.-F.*  $47^{\circ} 22' N$ ;  $8^{\circ} 35' E$ . 604 m. Sandstone.

*I.* Quervain-Piccard, 20,600 kg., N, E and Z; Bosch-Mainka, N and E; Wiechert, Z; Quervain-Piccard, transportable, N, E and Z, 1879.

*S.* Schweizerische Meteorologische Centralanstalt.

*Pu.* Annual bulletin.

## TABLE OF INSTRUMENTAL CONSTANTS

The following table of instrumental constants was compiled from the questionnaires received from the various seismological stations and from the latest available seismological bulletins in hand.

### ABBREVIATIONS

- A<sub>1</sub> Distance from the galvanometer lens to the face of the recorder (Galitzin).
- C Components.
- k Transfer constant, a constant depending upon the value of the inductive coupling (Galitzin).
- l Length of the equivalent simple pendulum (Galitzin).
- r/T<sub>0</sub><sup>2</sup> Frictional coefficient.
- S Sensitivity (trace amplitude per second of arc tilt).
- T<sub>1</sub> Undamped period of the galvanometer (Galitzin).
- T<sub>1</sub> Natural, undamped period of the seismometer (general).
- T<sub>0</sub> Natural, undamped period of the seismometer (Galitzin).
- Up Direction of motion of the steady mass corresponding to upward motion on the seismogram.
- V<sub>m</sub> Maximum nominal magnification.
- Damping ratio.
- μ<sup>2</sup> Damping constant (Galitzin).

## BOSCH-OMORI

Station	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping			Paper speed mm. min.	Up
					Kind	ε	r/T <sub>0</sub> <sup>2</sup>		
Ann Arbor, Mich.,	N	100	12	50	no	...	.....	15	N
U. S. A.	E	100	12	40	no	...	.....	15	W
Balboa Heights, C. Z.	N	100	20	35	...	...	.....	15	S
	E	100	20	35	...	...	.....	15	E
	N	25	.....	.....	...	...	.....	...	..
	E	25	.....	.....	...	...	.....	...	..
Berkeley, Calif.,	N	100	12	40	air	4	.002	15	S
U. S. A.	E	100	12	40	air	4	.002	15	E
DeBilt, Holland	N	25	18	20	...	4	.....	...	..
	E	25	18	20	...	4	.....	...	..
Fort de France,	N	12.5	.....	.....	...	...	.....	15	..
Martinique	E	12.5	.....	.....	...	...	.....	15	..
Hohenheim, Germany	N	50	9	23	oil	3	.....	15	S
	E	50	9	23	oil	3	.....	15	E
Ithaca, N. Y., U. S. A.	N	25	26	16	air	4	.....	15	N
	E	25	22	15	air	4	.....	15	E
Lemberg, Poland	N	25	30	10	air	5.3	.0048	15	N
	E	25	30	10	air	3.7	.0022	15	W
New Haven, Conn.,	N	.....	.....	.....	...	...	.....	...	..
U. S. A.	E	.....	.....	.....	...	...	.....	...	..
Port-au-Prince,	NE	70	6	40	none	...	.....	13	..
Haiti	NW	70	6	40	none	...	.....	13	..
Santiago, Chile	NNE	100	12	50	air	3	.011	15	..
	ESE	100	12	48	air	4	.012	15	..
Sitka, Alaska*	N	10	17	10	none	...	.001	15	S
	E	10	18	10	none	...	.001	15	W
Sofia, Bulgaria	N	10	22	10	...	...	.....	15	S
	E	10	22	10	...	...	.....	15	E
Tacubaya, Mexico	NE	25	16	10	...	...	.....	15	SW
	N	0.2	.....	.....	...	...	.....	15	..
	E	0.2	.....	.....	...	...	.....	15	..
Uzhorod,	N	10	13	10	...	4	.....	...	..
Czechoslovakia	E	10	13	10	...	4	.....	...	..
Volcano House,	N	100	7.4	116	oil	∞	.....	50	S
Hawaii	E	100	7.4	116	oil	∞	.....	50	E

\*Discontinued, 1930.

## CENTRAL METEOROLOGICAL OBSERVATORY TYPE

Station	C	Mass kg.	T <sub>o</sub>	V <sub>m</sub>	Damping			Paper speed <i>mm.</i> <i>min.</i>	Up
					Kind	ε	r/T <sub>o</sub> <sup>2</sup>		
Asahigawa, Japan	..	...	...	..	.....	...	...	...	..
Fukui, Japan	N	...	10	20	.....	...	...	...	..
	E	...	10	20	.....	...	...	...	..
Haboro, Japan	N	...	9.0	50	.....	...	...	...	..
	E	...	9.0	50	.....	...	...	...	..
Hiroshima, Japan	N	...	4.2	50	.....	...	...	...	..
	E	...	4.2	50	.....	...	...	...	..
Hukukoka, Japan	N	2.2	4.0	2	oil	3.6	.016	30	N
	E	2.2	4.0	2	.....	2.0	.042	30	E
	Z	0.2	1.0	2	.....	1.1	.300	30	U
Kofu, Japan	N	...	8.0	20	.....	...	...	...	..
	E	...	8.0	20	.....	...	...	...	..
Kumagaya, Japan	N	2.2	5.0	2	oil	3.5	.004	...	S
	E	2.2	5.0	2	.....	3.5	.004	...	W
	Z	0.23	1.5	2	.....	3.0	.003	...	D
Kyoto, Japan	N	2	5.0	2	magnetic	2.9	.002	...	..
	E	2	5.0	2	.....	2.4	.003	...	..
	Z	2	3.5	2	.....	1.2	.001	...	..
Matsumoto, Japan	N	...	10	20	.....	...	...	...	..
	E	...	10	20	.....	...	...	...	..
Miyako, Japan	N	...	7.0	50	.....	...	...	...	..
	E	...	7.0	50	.....	...	...	...	..
Miyazaki, Japan	N	2.3	3.5	2	magnetic	1.7	.080	28	..
	E	2.3	4.0	2	.....	1.7	.063	28	..
	Z	2.3	5.0	2	.....	2.2	.056	28	..
Muroran, Japan	N	...	4.5	50	.....	...	...	...	..
	E	...	4.5	50	.....	...	...	...	..
Obihiro, Japan	N	...	5.0	50	.....	...	...	...	..
	E	...	5.0	50	.....	...	...	...	..
Okayama, Japan	N	...	3.0	25	.....	...	...	...	..
	E	...	3.0	25	.....	...	...	...	..
Shimonoseki, Japan	N	...	3.7	37	.....	...	...	...	..
	E	...	3.7	37	.....	...	...	...	..
Sumoto, Japan	N	10	5	20	.....	...	...	...	..
Tsu, Japan	N	15	10	20	.....	...	...	...	..
	E	15	10	20	.....	...	...	...	..
Tokyo, Japan	N	...	3.5	2	.....	...	.015	...	N
	E	...	3.5	2	.....	...	.015	...	E
	Z	...	4.0	2	.....	...	.015	...	U
	N	...	4.5	50	.....	...	.009	...	S
	E	...	4.5	50	.....	...	.009	...	E
Wakayama, Japan	N	...	3.0	50	.....	...	...	...	..
	E	...	3.0	50	.....	...	...	...	..

## CONRAD

Station	C	Mass kg.	T <sub>o</sub>	V <sub>m</sub>	Damping			Paper speed <i>mm./min.</i>	Up
					Kind	ε	r/T <sub>o</sub> <sup>2</sup>		
Belgrade, Yugoslavia	N	30	3.6	30	air	4.1	.02	..	..
Dubrovnik, Yugoslavia	NW	40	5.3	47	air	2.3	.03	20	..
	SE	40	5.3	47	air	2.3	.03	20	..
Ravensburg, Germany	N	23	5.0	13	...	3.0	.002	15	S
Sibenik, Yugoslavia	E	40	3.6	25	air	4.2	.30	16	..
Vienna, Austria	NE	24	4.3	16	...	...	.002	15	..

## GALITZIN

Station	C	I	Undamped periods		$\mu^2$	$A_1$ mm.	k	Up	Paper speed mm./min.
			$T_s$	$T_g$					
Abisko, Sweden	N	123	11.8	11.8	— .08	1404	85	N	25
	E	122	11.9	11.8	— .12	1276	92	E	25
	Z	402	11.6	11.7	+ .21	1303	254	U	25
Baku, USSR	N	122	24.1	24.2	.00	1275	31	S	30
	E	127	24.4	24.6	+ .01	1290	35	W	30
	Z	398	12.5	12.7	+ .01	1338	208	D	30
Belgrade, Yugoslavia	N	148	17.2	....	+ .14	315	24	..	30
Berkeley, Calif., U. S. A.	N	112	12.0	12.0	0	1130	125	N	30
	E	113	12.0	12.0	0	1130	126	W	30
	Z	149	12.0	12.0	+ .002	1130	108	D	30
Buffalo, N. Y., U. S. A.	Z	...	....	....	....	....	...	D	30
Copenhagen, Denmark	N	125	12.5	12.6	+ .08	1000	107	..	..
	E	125	12.5	12.7	+ .20	1000	100	..	..
	Z	144	10.0	11.6	.00	1000	105	..	..
DeBilt, Holland	N	123	24.4	....	0	1380	11	N	30
	E	123	25.0	....	0	1380	11	E	30
	Z	406	12.0	....	0	1380	175	U	30
Florence, Italy	N	...	....	....	....	....	...	..	..
	E	...	....	....	....	....	...	..	..
	Z	...	....	....	....	....	...	..	..
Florissant, Mo., U. S. A.	N	...	12.5	12.9	0	....	130	..	..
	E	...	13.0	12.9	0	....	130	..	..
	Z	...	12.0	12.7	0	....	120	..	..
Georgetown, D. C., U. S. A.	N	...	25.6	26.0	+ .07	4270	81	..	30
	E	...	25.9	25.8	— .10	4290	93	..	30
	Z	41.1	10.0	9.1	.00	1530	288	..	30
Irkutsk, USSR	N	120	12.2	12.3	.00	1000	100	S	29
	E	115	12.5	12.2	+ .01	1000	115	W	29
	Z	424	12.3	12.4	— .04	1000	265	D	29
Königstein, Germany	N	100	19.5	....	0	2000	50	..	30
Kucino, USSR	N	124	25.0	24.3	— .05	1250	40	S	29
	E	122	21.9	24.6	— .02	1166	36	W	29
	Z	400	10.1	13.1	+ .08	1153	139	D	29
La Paz, Bolivia	E	112	11.7	11.7	— .39	1255	134	..	..
	Z	148	10.2	11.8	+ .46	1255	128	..	..
	N	125	11.8	11.7	+ .01	....	84	S	30
Leningrad, USSR	E	125	12.0	11.7	— .02	....	86	W	30
	Z	389	11.8	11.5	— .02	....	289	D	30
Makeevka, USSR	N	117	12.2	12.1	+ .01	1361	54	S	30
	E	108	13.0	13.4	— .01	1135	77	W	30
	Z	400	13.7	13.2	— .02	1228	184	D	30
Manila., P. I.	N	115	12.4	12.3	— .44	1005	107	..	..
	E	114	11.8	11.5	+ .068	1005	101	..	..
	Z	148	11.6	12.0	— 1.81	1005	78	..	..
Parc Saint-Maur, France	N	132	11.1	....	— .1	1000	80	..	30
	E	99	11.1	....	— .03	1000	76	..	30
	Z	432	11.7	....	+ .05	1000	288	..	30

## GALITZIN—Continued

Station	C	I	Undamped periods		$\mu^2$	A <sub>1</sub> mm	k	Up	Paper speed mm./min.
			T <sub>s</sub>	T <sub>g</sub>					
Pavia, Italy	..	...	....	....	....	....	...	..	32
	..	...	....	....	....	....	...	..	32
Pulvoko, USSR	N	124	14.8	13.7	+ .01	1383	93	S	30
	E	124	13.4	13.7	— .04	1354	92	W	30
	Z	407	14.0	13.2	+ .01	1365	248	D	30
Richmond, England	N	118	24.7	24.8	+ .014	1100	15.6	S	30
	E	118	24.8	23.9	+ .117	1100	13.8	W	30
	Z	360	13.0	12.7	— .350	1130	115.0	D	30
Riverview, Australia	N	124	14.8	13.7	+ .01	1383	93	S	30
	E	124	13.4	13.7	— .04	1354	92	W	30
	Z	407	14.0	13.2	+ .01	1365	248	D	30
Scoresby-Sund, Greenland	N	120	12.4	12.5	0	1000	29	..	..
	E	120	11.9	11.9	0	1000	39	..	..
	Z	141	10.1	9.5	0	1000	34	..	..
Stuttgart, Germany	N	112	12.1	11.9	+ .2	1000	105	..	..
	E	112	12.0	11.9	+ .2	1000	103	..	..
	Z	...	11.6	11.7	+ .05	1000	108	..	..
Sverdlovsk, USSR	N	124	25.2	24.8	+ .06	1323	53	S	30
	E	124	25.0	25.0	— .09	1336	47	W	30
	Z	399	12.7	12.8	+ .03	1459	467	D	30
Tachkent, USSR	N	116	12.8	13.0	+ .03	1158	83	S	15
	E	107	12.7	12.7	+ .04	991	75	W	15
	Z	394	12.3	12.3	+ .05	1160	258	D	15
Tiflis, USSR	N	124	12.5	....	— .009	....	80	S	60
	E	125	12.4	....	+ .007	....	80	W	60
	Z	407	12.3	....	+ .017	....	216	D	60
Tokyo, Japan	N	...	19.0	16.0	....	....	..	S	..
	E	...	19.0	16.0	....	....	..	W	..
	Z	...	10.0	12.0	....	....	..	U	..
Tokyo, Imp. Univ., Japan	N	...	24.0	....	....	....	..	..	..
	E	...	24.0	....	....	....	..	..	..
	Z	...	13.0	....	....	....	..	..	..
Uccle, Belgium	N	124	24.5	24.5	± .06	1035	40	..	30
	E	124	24.5	24.5	± .06	1035	40	..	30
Vladivostok, USSR	N	127	11.7	11.6	+ .07	1000	74	..	..
	E	130	12.0	11.6	+ .02	1000	80	..	..
	Z	378	13.2	11.7	+ .06	1000	251	..	..
Zi-ka-wei, China	Z	40.3	13.2	13.2	+ .01	1000	400	..	..



## GALITZIN (Mechanical)

Station	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping			Paper speed $\frac{mm.}{min.}$	Up
					Kind	$\epsilon$	$r/T_0^2$		
Budapest, Hungary	N	...	...	..	.....	...	...	25	..
	E	...	...	..	.....	...	...	25	..
Kabansk, USSR	N	...	12.0	45	magnetic	4	...	30	S
	E	...	12.0	45	magnetic	4	...	30	W
Piatigorsk, USSR	N	...	12.0	45	magnetic	4	...	30	S
	E	...	12.0	45	magnetic	4	...	30	W
Samarkand, USSR	N	...	23	45	magnetic	4	...	30	..
	E	...	23	45	magnetic	4	...	30	..
Tifis, USSR	N	...	20	50	magnetic	3.5	0.8	15	N
	E	...	21	60	magnetic	5.0	1.1	15	E

## GRAY-MILNE

Station	C	
Baku Gai, Japan	N	automatic starting
	E	.....
	Z	.....
Kingston, Jamaica	..	.....
Kosyun, Japan	..	automatic starting
Taihoku, Japan	N	automatic starting
	E	.....
	Z	.....
Tainan, Japan	N	automatic starting
	E	.....
	Z	.....
Taito, Japan	..	.....
Taityu, Japan	N	automatic starting
	E	.....
	Z	.....

## HAWAIIAN VOLCANO OBSERVATORY TYPE

Station	C	Mass kg.	T <sub>o</sub>	V <sub>m</sub>	Damping			Paper speed mm. min.	Up
					Kind	ε	r/T <sub>o</sub> <sup>2</sup>		
Hilo, Hawaii	N	70	..	130	oil	∞	..	30	..
	E	70	..	130	oil	∞	..	30	..
Kodiak, Alaska	N	70	..	130	oil	∞	..	30	N
	E	70	..	130	oil	∞	..	30	W
Kona, Hawaii	..	..	..	..	..	..	..	..	..
Mineral, Calif., U. S. A.	N	225	7	200	oil	∞	..	30	N
	E	lb.	7	200	oil	∞	..	30	W

## IMAMURA

Station	C	Mass kg.	T <sub>o</sub>	V <sub>m</sub>	Damping			Paper speed mm. min.	Up
					Kind	ε	r/T <sub>o</sub> <sup>2</sup>		
Kagoshima, Japan	N	...	8	2	.....	...	....	25	..
	E	...	8	2	.....	...	....	25	..
	Z	...	3	2	.....	...	....	25	..
Kochi, Japan	..	...	..	..	.....	...	....	..	..
Niigata, Japan	N	2.5	5.7	1	magnetic	2.1	.019	27	..
	E	2.4	7.1	1	magnetic	2.6	.019	27	..
	Z	0.4	2.3	1	magnetic	1.6	.059	27	..
Sendai, Japan	N	...	10	2	.....	...	....	..	..
Sikka, Japan	N	...	8	2	.....	...	....	..	..
	E	...	8	2	.....	...	....	..	..

## MAINKA

Station	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping			Paper speed mm. min.	Up
					Kind	ε	r/T <sub>0</sub> <sup>2</sup>		
Alicante, Spain	N	750	10	102	....	2.5	.002	15	..
	E	750	10	120	....	2.5	.02	15	..
Almeria, Spain	N	750	9.3	291	oil	...	.007	15	N
	E	750	9.4	218	oil	...	.006	15	E
	Z	500	10.0	93	oil	...	.008	15	U
Athens, Greece	N	136	5.8	80	....	5	.006	..	..
	E	136	5.8	80	....	5	.006	..	..
Barcelona, Spain*	N	141	9.8	50	....	3	.010	..	..
	E	144	10.5	49	....	4	.010	..	..
Belgrade, Yugoslavia	...	450	6.0	200	air	...	.064	..	..
Besançon, France	N	133	....	...	....	...	....	14	..
	E	133	....	...	....	...	....	14	..
Eger, Czechoslovakia	N	450	10	100	air	...	.005	..	..
Fort de France,	N	450	9	163	....	...	....	15	S
Martinique	E	450	9	164	....	...	....	15	W
Georgetown, D. C.,	N	135	10	200	....	2	.001	..	..
U. S. A.	E	135	10	214	....	4	.002	..	..
Halifax, Nova Scotia	N	139	10	...	air	6	....	12	..
	E	139	10	...	air	6	....	12	..
Hamburg, Germany	N	225	10	80	air	...	....	13	S
	E	225	10	80	air	...	....	13	W
Helsingfors, Finland	N	730	12	150	....	4	.004	20	..
	E	730	13	125	....	5	.003	20	..
	Z	300	5	100	....	2	.004	20	..
Hohenheim, Germany	N	450	9	143	....	3.7	.004	15	N
	E	450	9	129	....	4.0	.004	15	E
Innsbruck, Austria	NE	135	10	120	....	...	.003	16	NE
	NW	135	10	120	....	...	.003	16	SE
Karlsruhe, Germany	N	2000	7.6	300	....	4.2	....	16	N
	E	2000	7.5	300	....	4.2	....	16	E
Königstein, Germany	N	450	7	150	....	5	....	12	..
	E	450	7	150	....	5	....	12	..
Ksara, Syria	N	....	11	...	....	5	....	16	N
	E	....	11	...	....	3	....	16	W
La Plata, Argentina	N	450	12	220	none	...	.0003	13	..
	E	450	12	220	none	...	.0003	13	..
Le Mans, France*	N	....	7	43	....	...	....	6	..
	E	....	9	48	....	...	....	6	..
Malaga, Spain	N	750	10	120	oil	2	.001	15	N
	E	750	10	100	oil	3	.001	15	W
Marseilles, France	N	130	....	...	....	...	....	12	..
	E	130	....	...	....	...	....	12	..
Neuchatel,	N	146	7.2	46	....	...	....	30	..
Switzerland*	E	146	6.1	65	....	...	....	30	..
Nördlingen, Germany	E	465	5	200	....	...	....	..	..
Parc Saint-Maur,	N	400	7.5	135	....	...	.015	13	N
France	E	400	9.2	130	....	...	.02	13	W
Pic du Midi, France	N	433	10	...	....	...	....	15	N
	E	433	7.5	...	....	...	....	15	E
Puy de Dôme, France†	N	....	....	83	....	3	....	12	..
	E	....	....	85	....	3	....	12	..

\*Bifilar

†Bosch-Mainka.

## MAINKA—Continued

Station	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping			Paper speed mm. min.	Up
					Kind	$\epsilon$	$r/T_0^2$		
Ravensburg, Germany	N	450	9.0	130	....	2.5	.013	15	N
	E	450	9.1	143	....	2.3	.014	15	W
Reykjavik, Iceland	N	135	5.0	85	....	...	.02	18	..
	E	135	6.9	70	....	...	.01	26	..
Rio de Janeiro, Brazil	N	420	....	....	....	....	....	..	S
Riverview, Sydney,	N	450	6.5	134	....	3.5	.05	..	..
New South Wales*	E	450	8.6	135	....	2.9	.10	..	..
Saskatoon, Canada†	N	139	9.1	...	air	5	....	15	N
	E	139	9.3	...	air	5	....	15	E
Sendai, Japan	..	....	10	100	....	....	....	..	..
Tortosa, Spain	N	1500	14.8	170	....	....	.003	12	N
	E	157	7.8	62	....	....	.002	12	W
Tananarive,	N	450	13	131	air	4	.008	15	..
Madagascar	E	450	1.3	112	....	4	.006	15	..
Tokyo, Japan	N	450	10	88	....	....	.016	..	W
	E	450	11	88	....	....	.019	..	S
	N	450	8	125	....	....	.025	..	E
	E	450	12	102	....	....	.024	..	N
	Z	....	7.5	125	....	....	....	..	..

\*Conical Pendulum.

†Bifilar

## MILNE

Station	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping			Paper speed $\frac{\text{mm.}}{\text{min.}}$	Up
					Kind	$\epsilon$	$r/T_0^2$		
Accra, Africa	..	....	....	...	..	..	..	..	..
Adelaide, Australia	E	2.4	17	...	no	..	..	5	E
Aidu, Japan	N	....	6.7	50	..	..	..	..	..
	E	....	6.7	50	..	..	..	..	..
Andalgala, Argentina	N	2.4	17	...	..	..	..	13.3	..
	E	2.4	17	...	..	..	..	13.3	..
Cardiff, Wales	..	....	....	...	..	..	..	3	..
Christ Church, New Zealand	E	....	16	...	..	..	..	4	W
Hukukoka, Japan	N	2.6	2	5	....	..	.35	24	N
	E	2.6	2	5	....	..	.62	24	W
	Z	0.6	2	5	....	..	.13	24	D
Kodaikanal, India	..	....	16.5	9.8	..	..	..	..	..
Kyoto, Japan	N	2	4	5	....	..	.004	..	..
	E	2	4	5	....	..	.004	..	..
	Z	2	4	10	....	..	.004	..	..
Lima, Peru	E	....	18	...	..	..	..	4.3	..
Perth, W. Australia	E	....	16	...	..	..	..	..	..
Ponta del Gada, Azores	E	....	....	...	..	..	..	1.0	..
Puebla, Mexico	E	....	....	...	..	..	..	..	..
	Z	....	....	...	..	..	..	..	..
Saint Helena Island	E	....	....	...	..	..	..	4.0	..
San Fernando, Spain	N	....	20	7	..	..	..	4.0	..
	E	....	19	7	..	..	..	4.0	..
Suva, Fiji*	..	....	....	...	..	..	..	..	..
Swarthmore, Pa., U.S.A.	E	2.4	....	...	..	..	..	1.0	..
Sydney, Australia	E	....	20	...	no	..	..	4.3	E
Todatsu, Japan	N	5	3	5	..	..	..	24	..
	E	5	3	5	..	..	..	24	..
	Z	5	3	10	..	..	..	24	..
Tsu, Japan	N	3	6	5	..	..	..	..	..
	E	3	6	5	..	..	..	..	..
	Z	3	2	5	..	..	..	..	..
Wellington, New Zealand	E	.188	14.6	5.6	no	..	..	4.0	..

\*Twin Boom.

## MILNE-SHAW (Magnetic damping)

Station	C	Mass kg.	T <sub>o</sub>	V <sub>m</sub>	ε	S mm.	Paper speed $\frac{\text{mm.}}{\text{min.}}$	Up
Adelaide, South Australia	N	2.2	12	150	20:1	..	8	N
Bidston, England	N	2.2	..	...	...	..	8	S
Cambridge, Mass., U. S. A.	N	2.2	12	250	20:1	45	8	N
	E	2.2	12	250	20:1	45	8	W
Cape Town, Africa	E	...	..	...	...	..	8	W
Chicago, Ill., U. S. A.	N	2.2	12	150	20:1	26	8	N
	E	2.2	12	150	20:1	26	8	W
Colaba, India	N	2.2	12	250	26:1	..	8	N
Colombo, Ceylon	E	2.2	12	250	20:1	60	8	E
Copenhagen, Denmark	N	2.2	12	300	20:1	..	..	..
	E	2.2	12	300	20:1	..	..	..
Edinburg, Scotland	E	2.2	12	250	20:1	43	8	E
Fordham, N. Y., U. S. A.	N	2.2	10	250	20:1	38	8	..
	E	2.2	10	250	20:1	19	8	..
Helwan, Egypt	E	2.2	..	250	20:1	..	8	W
Hong Kong, China	N	2.2	12	..	20:1	..	8	S
	E	2.2	12	..	20:1	..	8	E
Honolulu, Hawaii	N	2.2	12	150	20:1	26	8	W
	E	2.2	12	150	20:1	28	8	S
Hyderabad, India	E	2.2	12	250	...	..	8	W
Melbourne, Australia	E	2.2	12	250	20:1	45	8	E
Naples, Italy*	N	...	..	...	...	..	..	..
	E	...	..	...	...	..	..	..
North Blackburn, England	E	...	12	150	20:1	26	8	E
Ottawa, Canada	N	2.2	12	250	20:1	44	8	N
	E	2.2	12	250	20:1	43	8	W
Oxford, England	N	...	15	200	...	..	8	N
	E	...	15	200	...	..	8	E
Perth, West Australia	N	2.2	12	250	20:1	45	8	N
Rio de Janeiro, Brazil	E	2.2	12	250	20:1	..	8	W
Stonyhurst†								
Strasbourg, France	N	2.2	..	...	...	..	8	..
	E	2.2	..	...	...	..	8	..
Toronto, Canada	N	2.2	12	150	20:1	26	8	S
	E	2.2	12	150	20:1	26	8	W
Victoria, Canada	N	2.2	12	250	20:1	..	8	N
	E	2.2	12	250	20:1	..	8	E
Wellington, N. Z.	N	2.2	10	150	23:1	..	8	N
	E	2.2	10	150	23:1	..	8	E

\*To be Installed.

†See North Blackburn.

## NIKIFOROFF (Magnetic Damping)

Station	Component	$l$	$v_0$	$T_0$	$\mu^2$	Paper speed $\frac{mm.}{min.}$	Up
Alma-ata, USSR	N	...	380	2.8	0.50	30	N
	E	...	360	3.0	0.50	30	W
Frunse, USSR	N	...	360	2.5	0.60	30	N
	E	...	385	2.5	0.60	30	W
Sebastopol, USSR	N	5.1	392	2.0	0.83	..	..
	E	4.7	425	2.0	0.83	..	..
Simferopol, USSR	N	5.1	392	2.0	0.84	29	S
	E	5.0	400	2.0	0.80	29	E
Theodosia, USSR	NNE	5.3	560	2.0	0.90	30	NNE
	ESE	5.3	560	2.0	0.90	30	SSW
Yalta, USSR	N13W	5.3	380	2.0	0.75	30	W
	N77E	5.4	370	2.0	0.82	30	N

## OMORI

Station	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping			Paper speed <i>mm.</i> <i>min.</i>	Up
					Kind	ε	r/T <sub>0</sub> <sup>2</sup>		
Asahigawa, Japan	..	....	....	....	....	....	....	..	..
Baguio, P. I.	N	....	....	....	....	....	....	..	..
	E	....	....	....	....	....	....	..	..
Dehra Dun, India	E	....	....	....	....	....	....	13	..
Hoko, Japan	N	....	14	6	....	....	....	..	..
	E	....	14	6	....	....	....	..	..
Hukukoka, Japan	E	15	21	20	none	....	.009	25	E
Husan, Korea	N	....	30	20	....	....	....	..	..
Kobe, Japan	N	20	18.0	20	....	....	.001	..	..
	E	20	16.8	20	....	....	.001	..	..
Kochi, Japan	N	....	13.7	34	....	....	.02	..	..
	E	....	13.2	27	....	....	.02	..	..
Kosyun, Japan	N	....	16.0	10	....	....	....	..	..
	E	....	16.0	10	....	....	....	..	..
Kumagaya, Japan	N	14.8	18.7	10	magnetic	1.4	.002	..	N
	E	14.8	27.1	10	magnetic	1.5	.002	..	W
Kyoto, Japan	N	11.9	5.0	50	....	....	.002	24	..
	E	11.9	5.0	50	....	....	.003	24	..
Maebashi, Japan	N	....	4.1	100	....	....	....	..	..
	E	....	4.1	100	....	....	....	..	..
Manila, P. I.	N	20	....	....	....	....	....	..	..
	E	20	....	....	....	....	....	..	..
Mito, Japan	N	....	30	20	....	....	....	..	..
	E	....	30	20	....	....	....	..	..
Mizusawa, Japan	N	....	36	20	....	....	....	..	..
	E	....	36	20	....	....	....	..	..
Nagano, Japan	N	15.1	17	10	....	3	.004	25	N
	E	15.8	17	10	....	3	.004	27	E
Nagoya, Japan	N	....	20	20	....	4	.04	25	N
	E	....	20	20	....	3	.02	25	W
Niigata, Japan	N	....	25	25	....	....	....	..	..
	E	....	25	25	....	....	....	..	..
Numazu, Japan	N	....	16	20	....	4.2	.005	..	..
	E	....	16	20	....	3.0	.018	..	..
Ootomari, Japan	E	13	30	20	....	....	.0017	12	..
Osaka, Japan	N	63	15	120	....	....	.005	..	..
	Z	4	15	20	....	....	.004	..	..
Saga, Japan	N	....	20	20	....	....	....	..	..
	E	....	20	20	....	....	....	..	..
Sendai, Japan	..	....	30	20	....	....	....	..	..
	..	....	30	20	....	....	....	..	..
Sumoto, Japan	N	20	20	17.2	....	2.3	.001	..	..
	E	20	20	16.5	....	2.4	.001	..	..
Tacubaya, Mexico	N	10	....	....	....	....	....	15	..
	E	10	....	....	....	....	....	15	..
Tadotu, Japan	N	12	3	50	....	....	.035	..	..
	E	12	3	50	....	....	.047	..	..
Tainan, Japan	N	....	13	6	....	....	....	..	..
	E	....	13	6	....	....	....	..	..
Taito, Japan	N	....	14	6	....	....	....	..	..
	E	....	14	6	....	....	....	..	..
Tokyo, Japan	N	....	16	20	....	....	.003	..	..
	E	....	16	20	....	....	.003	..	..



## OMORI PORTABLE (Japan)

Station	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping			Paper speed $\frac{mm.}{min.}$	Up
					Kind	$\epsilon$	$r/T_0^2$		
Asahigawa	....	...	5	50	...	...	....	..	.....
Awomori	....	...	3.5	50	...	...	....	..	.....
Hakodate	....	...	4.0	50	...	...	....	..	.....
Hamamatsu	N & E	7.5	5.0	30	...	...	.03	19	.....
Husiki	....	...	1.7	50	...	...	....	..	.....
Idzuhara	....	...	3.0	50	...	...	....	..	.....
Ishinomaki	....	...	3.0	50	...	...	....	..	.....
Jinsen	N & E	12	4.5	50	none	...	.02	18	S & W
Kanazawa	....	...	3	30	...	...	....	..	.....
Karenko	....	...	3.2	50	...	...	....	..	.....
Keijo	....	...	3.5	50	...	...	....	..	.....
Kochi	....	...	...	...	...	...	....	..	.....
Kure	....	...	3	20	...	...	....	..	.....
Kushiro	....	...	3	50	...	...	....	..	.....
Miyatsu	....	...	4	50	...	...	....	..	.....
Muroto	....	...	5	50	...	...	....	..	.....
Nagano	N & E	20	4	50	none	...	.02	18	N & W
Niihama	....	...	4	50	...	...	....	..	.....
Oiwake	....	...	5	50	...	...	....	..	.....
Ooita	....	...	6	50	...	...	....	..	.....
Ootomari	N & E	18	10	40	...	...	.002	..	S & W
Sakai	....	...	4	20	...	...	....	..	.....
Sasebo	....	...	4	50	...	...	....	..	.....
Suttu	....	...	4.5	50	...	...	....	..	.....
Tadotu	E	12	22	20	...	...	....	..	.....
Takayama	....	...	3	50	...	...	....	..	.....
Tokushima	....	...	4.5	50	...	...	....	..	.....
Utsunomiya	....	...	4.5	50	...	...	....	..	.....
Yagi	....	...	5	30	...	...	....	..	.....
Yokosuku	....	...	3	50	...	...	....	..	.....

## OMORI TROMOMETER

Station	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping			Paper speed $\frac{mm.}{min.}$	Up
					Kind	$\epsilon$	$r/T_0^2$		
Baku Gai, Japan	E	6	12	6	none	..	....	12.5	..
Hukukoka, Japan	N	47	14	120	none	..	.025	25	S
Jinsen, Korea	N	50	20	150	none	..	0.1	25	N
	E	50	20	150	none	..	0.06	25	E
Kagoshima, Japan	N	....	4.5	50	.....	..	....	....	..
	E	....	4.0	50	.....	..	....	....	..
Karenko, Japan	N	13.5	5	50	none	..	....	12.5	..
	E	13.5	5	50	none	..	....	12.5	..
Kosyun, Japan	E	6	20	10	none	..	....	12.5	..
Maron, Java	..	....	..	..	.....	..	....	....	..
Miyazaki, Japan	N	15	27	20	magnetic	..	.005	28	..
	E	15	16	20	magnetic	..	.021	28	..
	N	12	3.5	50	.....	..	.140	28	..
	E	12	2.5	50	.....	..	.080	28	..
Mizusawa, Japan	N	17.6	36	20	none	..	.0004	26	N
	E	45.0	16	100	none	..	.007	23	E
Niigata, Japan	N	15	3.3	30	.....	..	.053	12.5	..
	E	15	2.7	30	.....	..	.068	12.5	..
Ootomari, Japan	N	50	30	20	none	..	.0007	27.5	S
Osaka, Japan	N	17	30	20	.....	..	.003	....	..
	E	17	30	20	.....	..	.003	....	..
Sendai, Japan	..	....	5	50	.....	..	....	....	..
Shinomisaki, Japan	N	2.3	4.2	2	magnetic	..	.004	25	N
	E	2.3	4.0	2	magnetic	..	.004	25	W
	Z	1.0	4.2	3	magnetic	..	.003	25	D
Tadotu, Japan	N	12	3	50	magnetic	..	.035	24	..
	E	12	3	50	magnetic	..	.047	24	..
	Z	12	3	50	magnetic	..	....	24	..
Taihoku, Japan	N	55	16	120	none	..	....	12.5	S
	E	16	25	20	none	..	....	12.5	W
Tainan Si, Japan	E	6	12	6	none	..	....	12.5	..
Taito, Japan	E	6	12	6	none	..	....	12.5	..
Takayama, Japan	N	....	3	50	.....	..	....	....	..
	E	....	3	50	.....	..	....	....	..
Unzendake, Japan	N	120	20	...	.....	..	....	....	..
	E	120	20	...	.....	..	....	....	..

## QUERVAIN-PICCARD AND HEAVY PENDULUMS

Station	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping			Paper speed <i>mm.</i> <i>min.</i>	Up
					Kind	ε	1/T <sub>0</sub> <sup>2</sup>		
Budapest, Hungary	N	25	1.8	64	.....	4.2	.108	30 to 400	..
	E	25	1.8	66	.....	4.6	.158		
	Z	25	0.9	68	.....	3.0	.259		
Chur, Switzerland	N	13500	...	1350	magnetic	...	...	..	N
	E	13500	3.3	1350	magnetic	3.0	.15	..	W
	Z	13500	2.0	1350	magnetic	3.0	.15	..	U
Göttingen, Germany*	N	17000	...	...	.....	...	...	..	..
	Z	17000	...	...	.....	...	...	..	..
Jena, Germany	E	15000	1.5	2200	.....	25	...	60	..
Neuchatel, Switzerland	N	18100	2.9	1600	magnetic	4	...	60	N
	E	18100	2.9	1600	magnetic	4	...	60	E
	Z	18100	1.2	1500	magnetic	4	...	60	U
Strasbourg, France	N	19072	1.4	1658	.....	3	.7	55	S
	E	19072	2.0	947	.....	7	.2	55	E
Tacubaya, Mexico*	Z	.....	...	...	.....	...	...	..	..
Zürich, Switzerland	N	20600	3.0	1700	magnetic	4	.1	60	N
	E	20600	3.0	1700	magnetic	4	.1	60	E
	Z	20600	1.3	1700	magnetic	2	.6	60	U
	N	80	2.0	50	oil	5	.1	60	N
	E	80	2.0	50	oil	5	.1	60	E
	Z	80	1.0	50	oil	5	.5	60	U

\*See Wiechert.

## STIATTESI

Station	C	Mass kg.	T <sub>o</sub>	V <sub>m</sub>	Damping			Paper speed $\frac{mm.}{min.}$	Up
					Kind	$\epsilon$	$r/T_o^2$		
Chiavari (Genoa), Italy	NE	200	11.0	35	.....	...	....	30	..
Foggia, Italy	SE	200	12.8	46	.....	...	....	30	..
	N	...	....	..	.....	...	....	..	..
	E	...	....	..	.....	...	....	..	..
Moncalieri, Italy	N	260	19.4	34	.....	...	....	17	..
	E	260	20.3	35	.....	...	....	17	..
Quarto, Italy	N	500	21	50	.....	...	....	30	..
	E	500	17	50	.....	...	....	30	..

## STRONG MOTION INSTRUMENTS

Station	C	Mass kg.	T <sub>o</sub>	V <sub>m</sub>	Damping			Paper speed $\frac{mm.}{min.}$	Up
					Kind	$\epsilon$	$r/T_o^2$		
Heijo, Korea	N	...	5	2	.....	...	....	..	..
	E	...	5	2	.....	...	....	..	..
Jinsen, Korea	N	2.3	4	2	magnetic	2	.03	21	N
	E	1.3	4	2	magnetic	2	.03	21	W
	Z	1.5	4	2	magnetic	2	.03	21	U
Kobe, Japan	N	5	4	2	.....	...	....	..	..
	E	5	4	2	.....	...	....	..	..
	Z	5	4	2	.....	...	....	..	..
Nagano, Japan	N	2.3	3.5	2	.....	2.5	.004	25	N
	E	2.3	3.5	2	.....	2.5	.004	25	W
	Z	2.3	5.0	3	.....	2.5	.003	25	U
Osaka, Japan	N	1.7	5	1	.....	...	.003	..	..
	E	1.7	5	1	.....	...	.003	..	..
	Z	.89	5	2	.....	...	.003	..	..
Sumoto, Japan	..	5	4	2	.....	...	....	..	..

## VICENTINI

Station	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping			Paper speed mm. min.	Up
					Kind	ε	r/T <sub>0</sub> <sup>2</sup>		
Almeria, Spain	N	100	2.4	88	.....	...	0.011	10	S
	E	100	2.4	112	.....	...	0.027	10	W
	Z	50	0.8	109	.....	...	0.008	10	D
Ambulong, P. I.	N	...	...	...	.....	...	...	..	..
	E	...	...	...	.....	...	...	..	..
	Z	...	...	...	.....	...	...	..	..
Baguio, P. I.	N	...	...	...	.....	...	...	..	..
	E	...	...	...	.....	...	...	..	..
	Z	...	...	...	.....	...	...	..	..
Barcelona, Spain*	N	...	0.9	125	.....	...	...	..	..
	E	...	0.9	125	.....	...	...	..	..
	Z	56	...	...	.....	...	...	5	D
Florence, Italy	N	...	...	...	.....	...	...	60	..
	E	...	...	...	.....	...	...	60	..
	Z	...	...	...	.....	...	...	60	..
La Plata, Argentina	N	150	Pantograph	...	.....	...	...	100	..
	E	105	2.2	220	.....	...	.002	..	N
	Z	105	2.2	220	.....	...	.002	..	W
Malaga, Spain	N	54	0.8	265	.....	...	.001	..	D
	E	...	...	...	.....	...	...	..	..
	Z	100	2.4	72	.....	...	...	..	..
Manila, P. I.	N	...	...	...	.....	...	...	..	..
	E	...	...	...	.....	...	...	..	..
	Z	...	...	...	.....	...	...	..	..
Mostar, Yugoslavia	N	100	2.3	50	none	...	.05	15	..
	E	100	1.1	...	...	...	...	10	..
	Z	100	1.1	...	...	...	...	10	..
Naples, Italy	N	56	1.1	...	.....	...	...	10	..
	E	409	6.2	100	oil	2	.06	15	..
	Z	409	6.2	100	oil	2	.06	15	..
Padova, Italy	N	100	2.3	110	no	...	.02	9	..
	E	100	2.3	110	no	...	...	9	..
	Z	100	15	150	magnetic	3	.006	10	..
Pavia, Italy	N	...	...	...	.....	...	...	10	..
	E	...	...	...	.....	...	...	10	..
	Z	...	...	...	.....	...	...	10	..
Piacenza, Italy	N	100	13	130	.....	...	...	10	..
	E	100	13	130	.....	...	...	10	..
	Z	60	4	130	.....	...	...	10	..
Quarto, Italy	N	500	4.6	80	.....	...	...	30	..
	E	500	4.6	80	.....	...	...	30	..
	Z	...	...	...	.....	...	...	12	S
Tarente, Italy	N	100	2.4	100	.....	...	...	12	E
	E	100	2.4	100	.....	...	...	12	..
	Z	50	0.8	120	.....	...	...	12	..
Tortosa, Spain	N	100	2.4	77	.....	...	.008	12	E
	E	50	0.8	92	.....	...	.008	12	U
	Z	...	...	...	.....	...	...	10	S
Treviso, Italy	N	100	2.8	...	.....	...	...	10	E
	E	100	2.8	...	.....	...	...	10	S
	Z	45	0.9	...	.....	...	...	10	D
Venice, Italy	N	100	2.4	120	.....	...	...	300	..
	E	100	2.4	120	.....	...	...		..
	Z	50	.8	140	.....	...	...		..

\*Microseismograph.

## WIECHERT: ASTATIC AND VERTICAL

Station	C	Mass kg.	T <sub>o</sub>	V <sub>m</sub>	Damping				Paper speed <i>mm.</i> <i>min.</i>	Up
					Kind	ε	r	r/T <sub>o</sub> <sup>2</sup>		
Aachen, Germany	N	1000	12.0	215	...	5.5	...	.0010	14	S
	E	1000	12.6	200	...	7.0	...	.0013	14	E
Abisko, Sweden	N	130	9.0	60	air	5.0	0.6	....	10	N
	E	130	9.0	60	air	5.0	0.6	....	10	E
Alicante, Spain	Z	80	6.0	65	...	2.0	...	.025	7	N
Amboina,	N	1000	...	...	...	...	...	....	12	N
N. East Indies	E	1000	...	...	...	...	...	....	12	W
Ann Arbor, Mich.,	N	100	6	80	air	...	...	....	15	S
U. S. A.	E	100	5	80	air	...	...	....	15	E
Apia, Western	N	1000	9.0	130	...	4.5	...	....	16	N
Samoa	E	1000	9.0	130	...	4.5	...	....	16	E
	Z	180	2.5	70	...	3.0	...	....	9	D
Athens, Greece	N	1000	9.0	175	...	3.2	...	....	...	...
	E	1000	9.0	175	...	3.2	...	....	...	...
	Z	1300	6.0	180	...	3.0	...	....	...	...
Batavia, Java	N	1000	6.7	193	...	3.4	.14	....	15	N
	E	1000	6.5	210	...	3.4	.35	....	15	W
	Z	1300	4.8	330	...	2.9	1.31	....	4	D
Belgrade,	N	1000	12.6	180	...	3.4	...	.021	...	...
Jugoslavia	E	1000	12.6	180	...	3.4	...	.021	...	...
	Z	1300	4.8	170	air	2.8	...	.013	...	...
Bergen, Norway	N	1000	8.5	150	...	3.0	...	.022	15	...
	E	1000	9.0	100	...	3.0	...	.022	15	...
	Z	1300	3.5	90	...	1.5	...	.04	10	...
Berkeley, Calif.,	Z	80	5.0	40	air	4.0	...	.003	13	U
U. S. A.										
Bochum, Germany	N	1000	9	120	...	4.4	0.1	....	14	S
	E	1000	9	140	...	4.2	0.1	....	14	W
	N	200	7.2	68	...	8.0	0.4	....	10	S
	E	200	6.8	67	...	5.0	0.3	....	10	W
	Z	1300	3.4	180	...	2.1	0.12	....	10	D
Budapest,	N	1000	10.0	100	...	5.0	...	.0019	16	S
Hungary	E	1000	8.9	98	...	3.6	...	.0029	16	W
Buffalo, N. Y.,	N	80	7.0	80	air	5	...	....	9	N
U. S. A.	E	80	7.0	80	air	5	...	....	9	E
Butuan, P. I.	N	180	...	...	...	...	...	....	...	...
	E	180	...	...	...	...	...	....	...	...
Chicago, Ill.,	N	80	5.0	103	air	3	...	.011	10	S
U. S. A.	E	80	4.7	95	air	3	...	.0094	10	E
Chihuahua,	N	1200	6.0	250	...	2.8	...	....	15	S
Mexico	E	1200	6.0	250	...	2.8	...	....	15	...
	Z	1300	4.0	160	...	3.5	...	....	10	...
Cleveland, Ohio,	N	80	7.0	20	...	8	...	....	10	N
U. S. A.	E	80	7.0	20	...	8	...	....	10	W
Coimbra,	N	1000	13	130	...	5.0	...	.002	15	N
Portugal	E	1000	13	130	...	5.0	...	.002	15	W
	Z	...	4	80	...	...	...	....	10	U
Copenhagen,	N	1000	9.2	219	...	4.1	0.4	....	...	...
Denmark	E	1000	9.3	198	...	3.9	0.5	....	...	...
	Z	1300	5.7	165	...	4.0	0.3	....	...	...
Copiapo, Chile	N	...	...	...	...	...	...	....	1.0	...
	E	...	...	...	...	...	...	....	1.0	...

## WIECHERT: ASTATIC AND VERTICAL—Continued

Station	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping				Paper speed mm. min.	Up
					Kind	ε	r	r/T <sub>0</sub> <sup>2</sup>		
DeBilt, Holland	N	200	5.6	173	...	4	...	...	..	..
	E	200	5.6	162	...	4	...	...	..	..
Denver, Colo., U. S. A.	N	80	4.4	120	air	2	...	...	11	S
	E	80	4.3	130	air	3	...	...	11	E
Fordham, N. Y., U. S. A.	N	80	6	80	...	...	...	...	13	..
	E	80	6	80	...	...	...	...	13	..
Göttingen, Germany	N	1000	10.6	160	air	2.2	1.3	...	10	..
	E	1000	14.0	151	air	4.3	2.5	...	10	..
	Z	1300	3.6	233	air	2.2	0.4	...	..	..
	Z	17000	1.5	2100	air	2.2	0.4	...	60	..
Graz, Austria	N	1000	11.0	174	air	5.0	...	.008	15	N
	E	1000	11.0	225	air	5.0	...	.005	15	E
Guam, M. I.	N	180	...	...	...	...	...	...	15	..
	E	180	...	...	...	...	...	...	15	..
Hamburg, Germany	N	1000	10	220	air	5	...	.005	15	N
	E	1000	10	220	air	5	...	.005	15	E
	Z	1250	5	210	air	5	...	.010	15	D
Heidelberg, Germany	N	2100	7.4	90	air	...	0.53	...	6	N
	E	2100	12.9	240	air	...	1.30	...	6	W
Helgoland, Germany	N	985	11.5	126	air	4.1	...	...	13	S
	E	985	11.1	153	air	3.9	...	...	13	E
Hof, Germany	N	...	...	80	...	...	...	...	12	..
	E	...	...	80	...	...	...	...	12	..
	Z	...	...	...	...	...	...	...	12	..
Jena, Germany	N	1200	8.1	210	...	3.5	...	.02	15	S
	E	1200	8.0	200	...	3.0	...	.016	15	W
Jinsen, Korea	N	200	5.0	73	air	4.0	...	.02	26	S
	E	200	5.0	84	air	4.0	...	.02	26	E
	Z	80	4.0	87	air	...	...	.02	23	U
Johannesburg, Union of South Africa	N	200	...	...	no	...	...	...	9	..
	E	200	...	...	no	...	...	...	9	..
Kobe, Japan	N	80	3.8	95	...	ap.	...	.005	..	..
	E	80	3.9	92	...	ap.	...	.006	..	..
	Z	80	3.1	61	...	4.6	...	.002	..	..
Kochi, Japan	N	200	4.6	106	...	5.1	...	.03	31	..
	E	200	4.7	93	...	4.7	...	.03	31	..
	Z	80	3.6	87	...	...	...	.05	28	..
Königsburg, Germany	N	985	9.5	180	...	4.5	...	.015	15	N
	E	985	9.5	180	...	4.5	...	.015	15	W
	Z	1300	3.5	175	air	3.5	...	.04	12	U
Königstein, Germany	Z	80	4.0	100	...	5.0	...	...	12	..
Kumagaya, Japan	N	80	6.5	75	air	5.8	...	.019	..	S
	E	80	5.0	90	air	7.3	...	.018	..	E
	Z	80	3.6	50	air	2.0	...	.011	..	D
Kyoto, Japan	N	200	5.0	80	air	8.0	...	.0025	27	..
	E	200	4.5	80	air	7.0	...	.0026	27	..
	Z	80	5.0	80	air	8.0	...	.002	26	..
La Plata, Argentina	Z	80	3.1	185	none	...	.02	...	10	U

## WIECHERT: ASTATIC AND VERTICAL—Continued

Station	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping				Paper speed <i>mm.</i> <i>min.</i>	Up
					Kind	$\epsilon$	r	$r/T_0^2$		
Lawrence, Kans., U. S. A.	N	....	3.4	205	...	4	...	....	8	N
	E	....	3.4	177	...	4	...	....	8	W
Leipzig, Germany	N	1100	9.6	260	air	5.0	...	.0033	15	S
	E	1100	9.6	260	air	5.0	...	.0033	15	W
Lima, Peru	N	200	...	...	...	...	...	....	10	..
	E	200	...	...	...	...	...	....	10	..
Lisbon, Portugal	N	1000	12	238	...	7.8	1.1	....	15	N
	E	1000	12	248	...	7.4	1.4	....	15	W
	Z	300	...	...	...	...	...	....	15	D
Ljubljana, Yugoslavia	NE	200	6	114	...	6.0	.05	....	17	NE
	NW	200	6	160	...	4.0	.03	....	17	NW
Lund, Sweden	NE	1000	11.3	160	air	3.5	0.6	....	15	SW
	NW	1000	11.3	195	air	4.5	0.6	....	15	NW
Malabar, Java	N	100	...	...	...	...	...	....	12	..
	E	100	...	...	...	...	...	....	12	..
Málaga, Spain	Z	80	6.5	82	air	3	...	.007	10	D
Manila, P. I.	N	1000	7.7	165	...	4	...	.021	15	..
	E	1000	7.8	166	...	4	...	.025	15	..
Manzanillo, Mexico	N	125	5.0	80	...	3.5	...	....	14	N
	E	125	5.0	80	...	3.5	...	....	14	E
	Z	80	4.0	80	...	4.0	...	....	14	U
Mazatlan, Mexico	N	200	5.0	80	...	4.0	...	....	14	N
	E	200	5.0	80	...	4.0	...	....	14	E
	Z	80	4.0	80	...	4.0	...	....	14	U
Medan, Java	N	1000	...	...	...	...	...	....	..	..
	E	1000	...	...	...	...	...	....	..	..
Merida, Mexico	N	1200	6.0	250	...	2.8	...	....	15	S
	E	1200	6.0	250	...	2.8	...	....	15	..
	Z	1300	4.0	160	...	3.5	...	....	15	U
Milwaukee, Wis., U. S. A.	N	80	6.1	51	air	7	...	.0067	9	N
	E	80	5.4	61	air	9	...	.0047	9	W
Miyazaki, Japan	N	200	5.6	80	air	2.8	...	.024	28	..
	E	200	5.0	80	air	3.1	...	.018	28	..
	Z	80	6.8	80	air	2.9	...	.016	28	..
Mobile, Alabama	N	80	...	...	...	...	...	....	..	..
	E	80	...	...	...	...	...	....	..	..
Mt. Hamilton, Calif., U. S. A.	N	160	6.0	90	...	5	...	....	12	..
	E	160	6.0	90	...	5	...	....	12	..
	Z	80	3.0	60	...	7	...	....	12	..
Munich, Germany	N	1000	9	190	...	5	...	.004	15	S
	E	1000	9	190	...	5	...	.004	15	W
Nagano, Japan	N	200	6.4	60	...	4.0	...	.034	26	N
	E	200	6.4	60	...	4.0	...	.035	26	W
	Z	80	6.0	45	...	4.0	...	.043	25	U
Nagoya, Japan	N	200	5.7	64	air	6.1	...	.018	30	N
	E	200	5.9	64	air	5.1	...	.017	30	W
	Z	80	3.2	64	air	5.0	...	.083	35	U
Naples, Italy*	N	....	...	...	...	...	...	....	..	..
	E	....	...	...	...	...	...	....	..	..
New Orleans, La., U. S. A.	N	80	...	...	air	...	...	....	11	N
	E	80	...	...	air	...	...	....	11	E
	Z	80	...	...	...	...	...	....	11	U

\*Out of use.



## WIECHERT: ASTATIC AND VERTICAL—Continued

Station	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping				Paper speed <i>mm.</i> <i>min.</i>	Up
					Kind	ε	r	r/T <sub>0</sub> <sup>2</sup>		
Oaxaca, Mexico	N	200	5.0	80	...	4.0	...	...	13	N
	E	200	5.0	80	...	4.0	...	...	13	E
	Z	80	4.0	80	...	4.0	...	...	13	U
Ottawa, Canada	Z	80	5.2	160	air	7	...	...	15	U
	N	1000	10.5	225	...	5.0	0.9	...	13	S
Parc Saint Maur, France	E	1000	12.0	235	...	4.0	0.9	...	13	W
Piacenza, Italy	N	1000	13	230	air	3.2	...	...	15	..
	E	1000	13	232	air	2.8	...	...	15	..
Plauen, Germany	N	120	7	116	...	1.2	2.5	...	4	..
	E	120	7	116	...	1.2	2.5	...	4	..
Poughkeepsie, N. Y.	N	200	...	...	...	...	...	...	..	..
Puebla, Mexico	E	200	...	...	...	...	...	...	..	..
	N	10	4.0	20	...	3.0	...	...	14	N
Reno, Nevada, U. S. A.	E	10	4.0	20	...	3.0	...	...	14	E
	N	80	3.4	80	air	12	...	...	12	N
Riverview, NSW	E	80	3.4	80	...	12	...	...	12	W
	N	...	...	...	...	...	...	...	..	..
St. Louis, Mo., U. S. A.	E	...	...	...	...	...	...	...	..	..
	Z	...	...	...	...	...	...	...	..	..
Santa Clara, Calif., U. S. A.	N	80	...	83	air	8	...	.0034	15	N
	E	80	...	80	air	7	...	.0034	15	W
Santiago, Chile	N	80	...	...	...	...	...	...	10	..
	E	80	...	...	...	...	...	...	10	..
Sapporo, Japan	Z	...	...	...	...	5.0	...	...	10	..
	NNE	125	2.5	90	air	2	...	.08	..	..
Sendai, Japan	N	80	4.3	80	...	5.0	...	...	30	N
	E	80	4.3	80	...	5.0	...	...	30	W
Shinonisaki, Japan	Z	80	4.4	64	...	4.0	...	...	30	..
	N	...	6.0	90	...	...	...	...	..	..
Strasbourg, France	E	...	6.0	90	...	...	...	...	..	..
	Z	...	3.0	240	...	...	...	...	..	..
Sumoto, Japan	N	200	3.5	90	air	3.9	...	.040	25	N
	E	200	3.6	100	air	3.5	...	.039	25	W
Tacubaya, Mexico	Z	80	3.3	80	...	2.7	...	.040	25	D
	N	1000	9.0	180	air	3.5	1.5	...	15	N
Taihoku, Japan	E	1000	9.0	180	air	3.5	1.5	...	15	E
	Z	1200	3.2	360	...	4.5	1.0	...	15	U
Taihoku, Japan	N	80	4.8	115	...	∞	...	.004	..	..
	E	80	4.8	114	...	∞	...	.004	..	..
Taihoku, Japan	Z	200	4.3	96	...	3.0	...	.003	..	..
	N	17000	1.5	2000	...	2.5	...	...	60	..
Taihoku, Japan	E	17000	1.5	2000	...	2.5	...	...	60	..
	N	1200	6.0	200	...	2.8	...	...	15	..
Taihoku, Japan	E	1200	6.0	200	...	2.8	...	...	15	..
	N	200	5.0	200	...	3.5	...	...	15	..
Taihoku, Japan	E	200	5.0	200	...	3.5	...	...	15	..
	N	125	5.0	40	...	3.5	...	...	15	..
Taihoku, Japan	E	125	5.0	40	...	3.5	...	...	15	..
	Z	1300	4.0	160	...	3.5	...	...	15	..
Taihoku, Japan	Z	80	4.0	80	...	3.5	...	...	15	..
	N	200	6	80	air	...	...	...	27	N
Taihoku, Japan	E	200	6	80	air	...	...	...	27	W
	Z	80	6	50	air	...	...	...	29	U

## WIECHERT: ASTATIC AND VERTICAL—Continued

Station	C	Mass kg.	T.	V <sub>m</sub>	Damping				Paper speed $\frac{\text{mm.}}{\text{min.}}$	Up
					Kind	$\epsilon$	r	$r/T_0^2$		
Tarente, Italy	SW	200	8	120	...	...	...	...	10	NE
	SE	200	8	120	...	...	...	...	10	NW
Tokyo, Japan (C. M. O.)	N	200	4.0	79	...	...	...	.013	..	S
	E	200	3.9	77	...	...	...	.013	..	W
	Z	80	4.4	70	...	...	...	.004	..	U
Tokyo, Japan (Imp. Univ.)	N	200	25	120	air	3.5	...	...	10	..
	E	200	25	120	air	3.5	...	...	10	..
	Z	1300	6	120	air	3.0	...	...	..	..
Toledo, Spain	NE	1000	12	450	...	5	...	.03	20	NE
	NW	1000	12	440	...	5	...	.04	20	SE
	Z	1200	5	120	...	4	...	.001	20	U
Toyooka, Japan	N	...	4.2	110	...	$\infty$	...	.003	..	..
	E	...	4.1	102	...	2.7	...	.002	..	..
Tsingtao, China	N	80	8.0	64	...	2.1	...	.028	12	N
	E	80	8.0	64	...	2.1	...	.028	12	E
Uccle, Belgium	N	1000	10.7	145	air	4.0	...	.013	15	U
	E	1000	10.0	165	air	3.5	...	.020	15	..
	Z	1300	4.8	155	air	3.0	...	.013	15	..
Upsala, Sweden	N	1000	9.5	183	...	3.5	0.8	...	15	N
	E	1000	8.7	186	...	3.5	1.0	...	15	E
Vera Cruz, Mexico	N	200	5.0	80	...	4.0	...	...	13	U
	E	200	5.0	80	...	4.0	...	...	13	U
	Z	80	4.0	80	...	4.0	...	...	13	N
Victoria, Canada	Z	80	...	80	air	...	...	...	13	E
Vienna, Austria	N	1000	9.4	160	...	5	...	.0011	15	U
	E	1000	11.2	210	...	4	...	.0012	15	SW
	Z	1310	3.0	160	...	5	...	.0023	15	SE
Zagreb, Yugoslavia	NE	1000	9	200	air	...	...	.01	40	NE
	NW	1000	9	200	air	...	...	.01	40	SE
	NE	80	6	20	air	...	...	.01	20	..
	NW	80	6	20	air	...	...	.01	20	..
Zi-ka-wei, China	N	1200	9.0	170	...	2.5	...	.005	..	..
	E	1200	9.0	170	...	2.5	...	.005	..	U
	Z	80	6.0	40	...	2.0	...	.002	..	..
Zürich, Switzerland	Z	80	7.5	100	oil	5.0	1.0	...	30	..

## WIECHERT: HORIZONTAL AND VERTICAL

Station	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping				Paper speed mm. min.	Up
					Kind	$\epsilon$	r	r/T <sub>0</sub> <sup>2</sup>		
Akita, Japan	N	....	5.5	80	...	...	...	....	..	..
	E	....	5.5	80	...	...	...	....	..	..
	Z	....	5.0	70	...	...	...	....	..	..
Dairen, Japan	N	....	4.5	80	...	...	...	....	..	..
	E	....	4.5	80	...	...	...	....	..	..
	Z	....	4.5	70	...	...	...	....	..	..
Fukushima, Japan	N	....	4.5	70	...	...	...	....	..	..
	E	....	4.5	70	...	...	...	....	..	..
	Z	....	5.0	70	...	...	...	....	..	..
Georgetown, D. C., U. S. A.	N	200	4.8	109	...	1	...	....	..	..
	E	200	5.0	116	...	1	...	....	..	..
	Z	....	4.5	75	...	...	...	....	..	..
Gifu, Japan	N	....	4.5	75	...	...	...	....	..	..
	E	....	4.5	75	...	...	...	....	..	..
	Z	....	4.0	70	...	...	...	....	..	..
Hamada, Japan	N	....	4.5	84	...	...	...	....	..	..
	E	....	4.5	84	...	...	...	....	..	..
	Z	....	4.4	83	...	...	...	....	..	..
Hamamatsu, Japan	N	....	4.5	70	...	...	...	....	..	..
	E	....	4.5	70	...	...	...	....	..	..
	Z	....	4.0	80	...	...	...	....	..	..
Hatidyojima, Japan	N	....	5.0	80	...	...	...	....	..	..
	E	....	5.0	80	...	...	...	....	..	..
	Z	....	4.5	70	...	...	...	....	..	..
Hikone, Japan	N	....	5.5	80	...	...	...	....	..	..
	E	....	5.5	80	...	...	...	....	..	..
	Z	....	6.0	75	...	...	...	....	..	..
Ishigakijima, Japan	N	....	5.0	75	...	...	...	....	..	..
	E	....	5.0	75	...	...	...	....	..	..
	Z	....	5.0	70	...	...	...	....	..	..
Kagoshima, Japan	N	....	4.5	80	...	...	...	....	..	..
	E	....	4.5	80	...	...	...	....	..	..
	Z	....	4.5	70	...	...	...	....	..	..
Kakioka, Japan	N	....	7.1	75	...	...	...	....	..	..
	E	....	7.1	75	...	...	...	....	..	..
	Z	....	6.0	62	...	...	...	....	..	..
Kumamoto, Japan	N	....	4.5	75	...	...	...	....	..	..
	E	....	4.5	75	...	...	...	....	..	..
	Z	....	4.5	70	...	...	...	....	..	..
Kyusyu, Japan	N	....	4.5	70	...	...	...	....	..	..
	E	....	4.5	70	...	...	...	....	..	..
	Z	....	4.5	60	...	...	...	....	..	..
Matsuyama, Japan	N	....	5.0	80	...	...	...	....	..	..
	E	....	5.0	80	...	...	...	....	..	..
	Z	....	4.5	75	...	...	...	....	..	..
Mera, Japan	N	....	4.0	80	...	...	...	....	..	..
	E	....	4.0	80	...	...	...	....	..	..
	Z	....	4.0	80	...	...	...	....	..	..
Misima, Japan	N	....	4.2	75	...	...	...	....	..	..
	E	....	4.2	75	...	...	...	....	..	..
	Z	....	5.2	81	...	...	...	....	..	..
Morioka, Japan	N	....	5.5	80	...	...	...	....	..	..
	E	....	5.5	80	...	...	...	....	..	..
	Z	....	6.0	60	...	...	...	....	..	..

## WIECHERT: HORIZONTAL AND VERTICAL—Continued

Station	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping				Paper speed $\frac{\text{mm.}}{\text{min.}}$	Up
					Kind	$\epsilon$	r	$r/T_0^2$		
Nagasaki, Japan	N	....	5.0	80	...	...	...	....	..	..
	E	....	5.0	80	...	...	...	....	..	..
	Z	....	4.5	70	...	...	...	....	..	..
Nase, Japan	N	....	4.5	75	...	...	...	....	..	..
	E	....	4.5	75	...	...	...	....	..	..
	Z	....	4.5	70	...	...	...	....	..	..
Nemuro, Japan	N	....	5.0	80	...	...	...	....	..	..
	E	....	5.0	80	...	...	...	....	..	..
	Z	....	4.5	75	...	...	...	....	..	..
Numazu, Japan	N	....	4.6	89	...	10	...	.017	..	..
	E	....	4.6	89	...	10	...	.017	..	..
	Z	....	5.3	53	...	3.1	...	.016	..	..
Okinawa, Japan	N	....	5.0	80	...	...	...	....	..	..
	E	....	5.0	80	...	...	...	....	..	..
	Z	....	5.0	70	...	...	...	....	..	..
Ootomari, Japan	N	....	4.5	70	...	...	...	....	..	..
	E	....	4.5	70	...	...	...	....	..	..
	Z	....	4.5	70	...	...	...	....	..	..
Osaka, Japan	N	200	4.0	80	...	3.7	...	.023	..	..
	E	200	4.0	80	...	3.7	...	.023	..	..
	Z	80	4.0	80	...	3.5	...	.014	..	..
Potsdam, Germany	N	1000	10	280	...	4	...	....	..	..
	E	1000	6	330	...	2	...	....	..	..
Prague, Czechoslovakia	N	1000	10	237	...	5	...	.003	..	..
	E	1000	10	222	...	5	...	.003	..	..
Sarajevo, Yugoslavia	N	200	4.2	90	...	3.6	...	.08	..	..
	E	200	...	...	...	...	...	....	..	..
Simizu, Japan	N	....	4.5	70	...	...	...	....	..	..
	E	....	4.5	70	...	...	...	....	..	..
	Z	....	4.5	60	...	...	...	....	..	..
Spokane, Wash., U. S. A.	N	80	5.9	80	...	8	...	....	..	..
	E	80	5.1	80	...	8	...	....	..	..
Taiku, Japan	N	....	5.0	80	...	...	...	....	..	..
	E	....	5.0	80	...	...	...	....	..	..
	Z	....	4.5	70	...	...	...	....	..	..
Tsitsishima, Japan	N	....	4.5	75	...	...	...	....	..	..
	E	....	4.5	75	...	...	...	....	..	..
	Z	....	3.0	55	...	...	...	....	..	..
Tsukuba-san, Japan	N	....	4.5	75	...	...	...	....	..	..
	E	....	4.5	75	...	...	...	....	..	..
	Z	....	4.0	70	...	...	...	....	..	..
Tyōsi, Japan	N	....	5.0	75	...	...	...	....	..	..
	E	....	5.0	75	...	...	...	....	..	..
	Z	....	4.5	80	...	...	...	....	..	..
Unzen-dake, Japan	N	....	4.5	70	...	...	...	....	..	..
Wakayama, Japan	Z	....	4.0	75	...	...	...	....	..	..
Yokohama, Japan	N	....	4.5	70	...	...	...	....	..	..
	E	....	4.5	70	...	...	...	....	..	..
	Z	....	4.0	80	...	...	...	....	..	..

## WOOD-ANDERSON

Station	C	T <sub>0</sub>	V <sub>m</sub>	ε	Sensi- tivity	Paper speed <i>mm.</i> <i>min.</i>	Up
Berkeley, Calif., U. S. A.	N	0.8	3000	15	..	60	N
	E	0.8	3000	15	..	60	E
Cincinnati, Ohio, U. S. A.	N	5.5	500	8	..	15	S
	E	5.5	500	8	..	15	E
	N	1.5	1500	8	..	60	N
	E	1.5	1500	8	..	60	W
Copenhagen, Denmark*	N	...	....	..	..	..	..
	E	...	....	..	..	..	..
Florissant, Mo., U. S. A.	N	2.2	2400	8	..	60	N
	E	2.2	2400	8	..	60	E
Haiwee, Calif., U. S. A.	N	0.8	1400	h=0.8	..	60	S
	E	0.8	1400	h=0.8	..	60	E
La Jolla, Calif., U. S. A.	N	0.8	1400	h=0.8	..	60	S
	E	0.8	1400	h=0.8	..	60	W
Little Rock, Ark., U. S. A.	N	2.0	2400	8	..	60	..
	E	2.0	2400	8	..	60	..
Mt. Hamilton, Calif., U. S. A.	N	0.8	3000	15	..	60	N
	E	0.8	3000	15	..	60	W
Mt. Wilson, Calif., U. S. A.	N	0.8	1400	h=0.8	..	60	S
	E	0.8	1400	h=0.8	..	60	W
Pasadena, Calif., U. S. A.	N	0.8	1400	h=0.8	..	60	S
	E	0.8	1400	h=0.8	..	60	W
	N	6.0	400	h=0.8	..	60	N
	E	6.0	400	h=0.8	..	60	W
Riverside, Calif., U. S. A.	N	0.8	1400	h=0.8	..	60	S
	E	0.8	1400	h=0.8	..	60	W
Santa Barbara, Calif., U. S. A.	N	0.8	1400	h=0.8	..	60	S
	E	0.8	1400	h=0.8	..	60	E
Sitka, Alaska†	E	6.5	1400	20	..	15	..
St. Louis, Mo., U. S. A.	N	6.0	763	8	..	60	S
	E	6.0	760	8	..	60	E
Stanford University, Calif., U. S. A.	N	0.8	3000	15	..	60	S
	E	0.8	3000	15	..	60	W
Tinemaha, Calif., U. S. A.	N	0.8	1400	h=0.8	..	60	N
	E	0.8	1400	h=0.8	..	60	W
Tucson, Ariz., U. S. A.	N	10.5	435	20	56	30	N
	E	10.0	435	20	51	30	W

\*Not in operation.

†Temporary installation.

## INSTRUMENTS OF TOKYO IMPERIAL UNIVERSITY

Station	Instru- ment No.	Type	Com- ponent	Steady mass kg.	V <sub>max</sub>	T <sub>0</sub>	ε	Kind of damping	Paper speed mm./min.
Imperial University	1	.....	N	2	0.5	8.0	1.5	.....	50
	1	.....	E	2	0.5	8.0	2.0	.....	50
	1	.....	Z	1	0.5	5.7	1.3	.....	50
	2	.....	N	2	2.0	9.0	2.2	oil	40
	2	.....	E	2	2.0	9.0	2.0	oil	40
	2	.....	Z	0.45	2.0	5.0	2.0	oil	40
	3	.....	N	15	1.5	30	1.6	.....	65
	3	.....	E	15	1.5	32	1.2	.....	30
	4	.....	N	7	50	10	1.7	.....	60
	4	.....	E	7	50	10	1.3	.....	60
	5	.....	N	30	300	7.5	3.0	.....	100
	5	.....	E	30	300	11.5	3.0	.....	100
	6	.....	E	15	15	26	3.0	.....	15
	7	.....	N	15	10	33	1.5	.....	25
	8	.....	N	35	120	17	2.0	.....	60
	9	Wiechert	N	200	120	25	3.5	air	10
	9	Wiechert	E	200	120	25	3.5	air	10
	10*	Tanaru	..	30	....	....	..	.....	150
	11†	Gray	N	1.5	2	5	1.5	.....	100
	11†	Ewing	E	1.5	2	5	1.5	.....	100
	11†	Ewing	Z	0.75	2	5	1.2	.....	100
	12†	Tanakadate	N	1.5	1	2	1.5	.....	150
	12†	Tanakadate	E	1.5	1	2	1.5	.....	150
	12†	Tanakadate	Z	1.5	1	2	1.5	.....	150
	13	.....	E	13	10	30	1.2	.....	12
	14	.....	E	17	15	55	3.2	magnetic	27
	15	.....	N	42	20	50	1.1	magnetic	30
	16	.....	E	10	15	13.5	1.1	magnetic	50
	17	.....	N	40	120	25	2.0	.....	25
	17	.....	E	60	120	19	2.5	.....	25
	18	Wiechert	Z	1300	120	6	3.0	air	15
	19	.....	Z	15	30	12	1.7	.....	40

\*Accelerometer 1 cm = 0.1 g.

†Automatic starting.

INSTRUMENTS OF TOKYO IMPERIAL UNIVERSITY—Continued

Station	Instru- ment No.	Type	Com- ponent	Steady mass kg.	V <sub>max</sub>	T <sub>0</sub>	ε	Kind of damping	Paper speed mm./min.
Imperial University	20	.....	N	1900	1500	4	...	air	90
	20	.....	E	1900	1500	4	...	air	90
	21	Galitzin	N	13	1000	24	∞	magnetic	27
	21	Galitzin	E	13	1000	24	∞	magnetic	27
	22	.....	Z	10	20	12	...	.....	22
	22	.....	Z	13	800	13	∞	magnetic	30
	23*	.....	N	8	15	32	1.2	.....	0.1
	24*	.....	E	8	15	32	1.2	.....	0.1
	24*	Ishimoto	..	.0007	10	20	...	.....	.028
	25	.....	N	2	2	10	2.0	oil	40
Kamakura	1	.....	E	2	2	10	2.0	oil	40
	1	.....	Z	0.45	2	5	2.0	oil	40
	1	.....	E	15	10	30	1.2	.....	15
	2	.....	Z	4	10	10	2.0	.....	25
	3	.....	N	7	50	10	1.5	.....	50
	4	.....	E	7	50	10	1.5	.....	50
	4	.....	N	7	50	8	1.5	.....	50
	1	.....	E	7	50	8	1.5	.....	50
	1	.....	N	12	120	4	1.5	.....	50
	1	.....	E	12	120	4	1.5	.....	50
Kiyosumi	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	300	..	...	.....	..
	2	.....	N	30	300	..	...	.....	..
	2	.....	E	30	300	..	...	.....	..
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
Misaki	1	.....	N	30	300	..	...	.....	..
	2	.....	E	30	300	..	...	.....	..
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
Mitaka	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
Tytibu	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
Togane	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
	1	.....	N	7	50	10	1.5	.....	50
	1	.....	E	7	50	10	1.5	.....	50
Tukuba	1	Gray	N	1.5	2	5	1.5	.....	600
	1	Ewing	E	1.5	2	5	1.5	.....	600
	1	Ewing	Z	0.75	2	5	1.5	.....	600
	1	.....	N	35	120	19	2.0	.....	25
	2	.....	N	35	120	19	2.0	.....	25
	2	.....	N	35	120	19	2.0	.....	25
	2	.....	N	35	120	19	2.0	.....	25
	2	.....	N	35	120	19	2.0	.....	25
	2	.....	N	35	120	19	2.0	.....	25
	2	.....	N	35	120	19	2.0	.....	25

\*Clinograph.  
†Automatic starting.

## MISCELLANEOUS INSTRUMENTS

Station	Instrument	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping			Paper speed mm./min.	Up
						Kind	ε	r/T <sub>0</sub> <sup>3</sup>		
Aachen, Germany	Wiechert photographic	N	80	16	105	....	....	.0002	14	..
	Wiechert photographic	E	80	16	105	....	....	.002	14	..
	Wiechert photographic	Z	80	....	....	....	....	.05	14	..
Agra, India	Omori-Ewing	N	50	29	22	....	1	....	12	S
	Omori-Ewing	E	50	27	28	....	1	....	12	E
Alger-Bouzaréah, Algeria	Bosch-Mainka	N	400	....	....	....	....	....	15	..
	Bosch-Mainka	E	400	....	....	....	....	....	15	..
Alipore, India	Omori-Ewing	N	....	30	29	....	....	....	25	N
	Omori-Ewing	E	....	29	29	....	....	....	25	E
	Omori-Ewing	E	25	14	17	....	....	.003	15	S
Almeria, Spain	Bosch	E	25	14	19	....	....	.004	15	W
	Bosch	E	....	....	....	....	....	....	15	..
Barcelona, Spain	Javier-Canisio	N & E	....	....	....	....	....	....	15	..
Batavia, Java	Bosch	N	360	4.6	160	none	4	.07	..	..
Belgrade, Jugoslavia	Belar	E	360	4.2	150	none	4	.03	..	..
	Belar	Z	360	0.6	20	none	3	.02	..	..
Bergen, Norway	Bosch	N	10	23	40	....	1.5	.02	15	..
	Bosch	E	10	18	37	....	....	1.4	15	..
	Bosch	E	50	4	47	....	....	....	27	..
Carloforte, Italy	Cartuja bi-filar	N & E	340	10	60	....	4	.002	..	..
Cartuja, Spain	Belarmino	N & E	340	3.5	12	....	....	....	..	..
	Javier	E	7.5	15	....	....	....	....	..	..
	.....	E	3000	5.4	760	....	4	.01	..	..
Chiavari, Italy	.....	N	3000	4.0	590	....	4	.01	..	..
	Alfani	SE	120	12	25	....	....	....	..	..
	Under construction	Z	600	....	....	....	....	....	..	..
	.....	Z	895	1.3	20	none	....	....	..	..
	.....	....	80	7	400	none	....	....	..	..



## MISCELLANEOUS INSTRUMENTS—Continued

Station	Instrument	C	Mass kg.	T <sub>o</sub>	V <sub>m</sub>	Damping			Paper speed mm./min.	Up
						Kind	ε	r/T <sub>o</sub> <sup>2</sup>		
Colaba, India	Horizontal pendulum	N & E	....	....	...	....	....	....	..	..
	Omori-Ewing	E	....	....	...	....	....	....	..	..
Columbia, So. Carolina	McComb-Romberg	N & E	10	12	75	oil	20	....	15	..
Denton, Texas	Local construction	E	35	3.8	50	none	....	....	12	..
Ebro, Spain	.....	Z	316	2.6	98	....	....	.003	..	..
Eger, Czechoslovakia	Horizontal pendulum	N & E	1	12	110	magnetic	....	....	..	..
	photographic register									
Florence, Italy	Omori-Alfani	N & E	500	....	40	....	....	....	100	..
	Alfani	N & E	200	....	25	....	....	....	100	..
	Alfani	Z	200	....	150	....	....	....	100	..
Foggia, Italy	Agamennone, Bartelli	....	....	....	...	....	....	....	..	..
	trinomometer, De Rossi,									
	Cecchi									
Gorje, Yugoslavia	Belar	....	....	....	...	....	....	....	..	..
Hamburg, Germany	v. Reuber-Hecker	....	....	....	...	....	....	....	..	..
Hohenheim, Germany	Schmidt, tri-filar	....	....	5.6	50	....	....	....	15	..
Iida, Japan	Nakamura	N & E	....	4.2	215	....	2	.03	..	..
Jena, Germany	.....	Z	1300	....	...	....	....	....	..	..
Kingston, Jamaica	Duplex pendulum	....	....	....	...	....	....	....	..	..
Kumagaya, Japan	Nakamura	N & E	16	6	30	magnetic	4	.008	12	..
La Paz, Bolivia	.....	N	2000	14	180	oil	....	.002	..	..
	.....	E	3500	12	350	oil	....	.001	..	..
	.....	E	1500	2.4	1100	oil	....	.001	..	..
Livorno, Italy	.....	N & E	300	....	...	....	....	....	..	..
	Horizontal pendulum	N	300	....	...	....	....	....	..	..
	Horizontal pendulum	N	300	....	...	....	....	....	..	..
	Horizontal pendulum	E	207	....	...	....	....	....	..	..
	Horizontal pendulum	E	100	....	...	....	....	....	..	..
	Vertical pendulum	Z	107	....	...	....	....	....	..	..
	Pantografico	Z	45	....	...	....	....	....	..	..
	.....	....	....	....	...	....	....	....	..	..

## MISCELLANEOUS INSTRUMENTS—Continued

Station	Instrument	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping			Paper speed mm./min.	Up
						Kind	ε	r/T <sub>0</sub> <sup>2</sup>		
Madrid, Spain	Wiechert, new	N & E	200	3	20	...	...	...	13	..
Mineo, Italy	Guzzanti	N, E & Z	20	2.6	13	...	...	...	4	..
	Brassart	N & E	50	...	...	...	...	...	22	..
Moncaliere, Italy	Agamennone	ENE	800	15	70	...	...	...	...	...
	Horizontal pendulum	Z	650	3.2	58	...	...	...	...	...
Montecassino, Italy	Cancani	N & E	...	...	...	...	...	...	...	..
	Agamennone	N, E & Z	...	...	...	...	...	...	...	..
	.....	N & E	...	5	4	...	...	...	...	..
Mt. Hamilton, Calif.	Nakamura	N & E	...	5.6	50	...	...	...	...	..
Onahama, Japan	Omori clinometer and	N & E	6	15	15	...	...	.003	...	..
Osaka, Japan	Nakamura	N, E & Z	...	...	...	...	...	...	15	..
	Bosch photographic	E	200	5.2	120	air	2	...	15	E
	Bosch photographic	NE & NW	200	6.2	120	air	10	...	25	..
Ottawa, Canada	Agamennone	...	50	6	30	...	...	...	...	..
	.....	...	...	...	...	...	...	...	...	..
Piacenza, Italy	Local construction	N, E & Z	...	...	1	...	...	...	12	..
Plymouth, England	Agamennone	N & E	2000	2.3	400	...	...	...	16	..
Point Loma, Calif.	Agamennone	N & E	3000	15	110	...	...	...	16	..
Rocca di Papa, Rome, Italy	Agamennone microseismo- metrograph	N & E	400	8	100	...	...	...	16	..
	Agamennone microseismo- metrograph	Z	450	6	100	...	...	...	16	..
	Agamennone seismometrograph	N & E	200	4.3	14	...	...	...	6	..
	Brassart automatic starting	N & E	10	4.3	10	...	...	...	500	..
	.....	N	...	3.0	10	...	...	...	500	..
	Agamennone, automatic starting	N & E	2	4	1.5	...	...	...	...	..
		Z	2	2	1.5	...	...	...	...	..

## MISCELLANEOUS INSTRUMENTS—Continued

Station	Instrument	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping			Paper speed mm./min.	Up
						Kind	ε	r/T <sub>0</sub> <sup>2</sup>		
Collegio Romano, Rome, Italy	Agamennone	NE	50	8	50	...	...	...	27	..
	Agamennone	NW	50	8	50	...	...	...	27	..
	.....	N	1100	30	16	...	...	.001	15	S
San Fernando, Spain	.....	N	600	13	90	...	...	.005	15	N
	.....	E	60	24	12	...	...	.0004	15	W
	.....	Z	700	2	270	...	...	.06	15	E
San Juan, Porto Rico	Wenner, galvanometric registration	N	...	12.5	1500	electro magnetic	20	...	16	S
	.....	E	...	...	...	...	...	...	...	E
	.....	N & E	850	18	80	air	3	.015	...	..
Santiago, Chile	Omori microseismograph	...	...	15	120	...	...	...	...	..
	Nakamura	Z	...	10	10	...	...	...	...	..
	Horizontal pendulum	N	80	10	54	magnetic	3	...	15	..
Stuttgart, Germany	Horizontal pendulum	E	80	8	53	magnetic	2	...	15	..
	Astatic pendulum	N & E	30	...	...	...	...	...	...	..
	Bi-filar	N & E	3000	12	300	...	3	.002	10	..
Sucre, Bolivia	.....	Z	1340	3	670	none	...	.002	...	..
	.....	...	...	...	...	...	...	...	...	..
	Wiechert-Minthrop, Schmidt trifilar	...	...	...	...	...	...	...	...	..
Tacubaya, Mexico	Nakamura	N & E	...	3.3	20	...	...	...	...	..
	Cecchi	...	...	...	...	...	...	...	...	..
	Cartuja bi-filar	E	500	12	25	...	...	...	12	..
Takariva, Madagascar	Cancani	N & E	1.5	5	2	...	1.5	...	60	..
	Gray-Ewing, automatic starting	Z	.75	5	2	...	1.2	...	100	..
	Tanaru accelerometer	N, E & Z	1.5	2	1	...	...	...	100	..
Tortosa, Spain*	Tanakadate	...	1.5	2	1	...	...	...	...	..
	.....	...	.0007	20	10	...	...	...	...	..
	Ishimoto clinograph	...	...	...	...	...	...	...	...	..
	.....	...	...	...	...	...	...	...	...	..

\*See Ebro.

## MISCELLANEOUS INSTRUMENTS—Continued

Station	Instrument	C	Mass kg.	T <sub>0</sub>	V <sub>m</sub>	Damping			Paper speed mm./min.	Up
						Kind	ε	1/T <sub>0</sub> <sup>2</sup>		
Trenta, Italy	Agamennone	N & E	50	7	50	...	...	...	..	..
	Agamennone	Z	50	1.8	50	...	...	...	..	..
	Agamennone	Z	1000	2.8	250	...	...	...	17	..
Treviso, Italy	Alfani	N	100	20	...	...	...	...	17	..
	Alfani	E	100	14	...	...	...	...	17	..
	Alfani	Z	200	2.6	...	...	...	...	17	..
Tukuba, Japan	Gray-Ewing, automatic starting	N & E	1.5	5	2	...	1.5	...	600	..
	Nakamura	Z	.75	5	2	...	...	...	600	..
Uwajima, Japan	Omori-Alfani	N & E	...	5	50	...	...	...	..	..
Valle di Pompeii, Naples, Italy	Navarro-Neumann	N & E	225	10	10	...	...	...	1.6	..
	Mercalli-Grablovitz	E	850	1.9	150	...	...	...	3.0	..
	Mercalli-Grablovitz	N	500	2.0	270	...	...	...	18	..
	Alfani	N & E	1000	1.0	140	...	...	...	7.3	..
		Z	200	19	100	...	...	...	1.6	..
Venice, Italy	.....	N	50	5	44	...	...	...	27	..
	Horizontal pendulum	E	50	2.8	49	...	...	...	27	..
Yagi, Japan	Nakamura	E	18	...	30	...	...	.004	19	..
Yamagata, Japan	Bosch-Mainka	N & E	...	8	50	...	...	...	..	..
Zürich, Switzerland	Bosch-Mainka	N	...	9.5	120	...	5	.01	30	N
		E	...	9.5	120	...	5	.01	30	E

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